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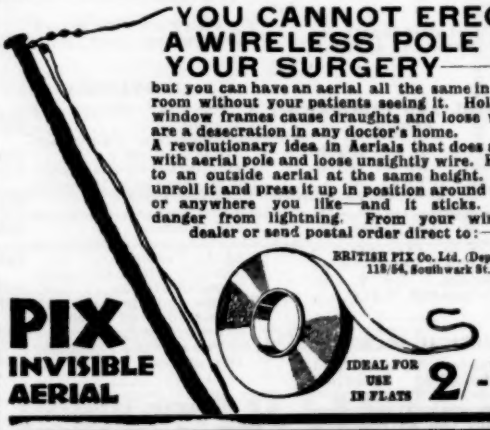

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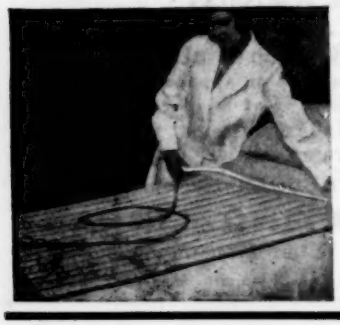

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ADDRESSES AND ORIGINAL ARTICLES

PHTHISIS PULMONALIS DUE TO THE BOVINE TYPE OF TUBERCLE BACILLUS

AN ACCOUNT OF TEN NEW SCOTTISH CASES

BY A. STANLEY GRIFFITH, M.D.VICT., PH.D. CAMB.
MEMBER OF THE SCIENTIFIC STAFF, MEDICAL RESEARCH COUNCIL
AND
W. T. MUNRO, M.D. ST.AND., F.R.C.P. EDIN.
MEDICAL SUPERINTENDENT, GLENLOMOND SANATORIUM

UNTIL within the last ten years the bovine tubercle bacillus, although of frequent occurrence in the non-pulmonary forms of human tuberculosis, had rarely been found in cases of ulcerative pulmonary tuberculosis (phthisis pulmonalis). At the Washington Congress in 1908 Koch, in support of his view that the bovine was less virulent for man than the human tubercle bacillus, maintained that the former type of bacillus had never been definitely demonstrated in a case of phthisis. At that date, however, relatively few cases of this form of the disease had been examined bacteriologically, and, in order to fill this gap, on the initiative of Koch, workers in many different countries undertook the typing of cultures of tubercle bacilli obtained from the sputum of phthisical persons. The results of these early investigations were reviewed by one of us in 1914 and 1932, and are here briefly summarised. Of 926 cases reported by foreign investigators three only yielded bovine bacilli, and in two of these three the bovine bacilli were shown to be associated with bacilli of human type, the latter preponderating, while in the third case (de Jong-Stuurmann) the eugonic character of the culture indicated that in this instance also tubercle bacilli of both types were coexistent in the sputum of the patient.

In Great Britain, on the other hand, Griffith,[1] working for the Royal Commission on Tuberculosis, found among 29 phthisical persons in England two adult males, aged 21 and 31 years respectively, who were expectorating tubercle bacilli of the bovine type only with the sputum. On extending his inquiries to Scotland he [2] discovered in 1913, among 73 cases—45 from Edinburgh and 28 from Glasgow and Lanark—the first Scottish case, a girl of 16½, from Edinburgh. In these three cases the bovine bacilli were obtained repeatedly from the sputum, and no other type was present. Thus it was shown beyond reasonable doubt that the bovine tubercle bacillus can cause typical phthisis pulmonalis. In 1916 Wang [3] reported, among 29 examined, another case from Edinburgh, but in this instance only one examination could be made.

No further case came to light in Great Britain until 1924, when Tulloch, Munro, Ross, and Cumming [4] reported that two of the 100 strains which they had obtained from the sputum of 100 phthisical persons in Glenlomond Sanatorium were culturally of the bovine type and virulent for rabbits, though not so highly virulent as standard bovine bacilli. Since that date cultures of tubercle bacilli have been raised by Munro from the sputum of every phthisical person admitted to Glenlomond Sanatorium, with the remarkable result that down to the middle of 1932, out of 445 cases examined, bovine tubercle bacilli were found by him in no fewer than 18 cases, in one instance associated with human bacilli. In addition Munro found bovine bacilli in the sputum of a case of phthisis from the county of Roxburgh. During the period from 1916 onwards one of us (A. S. G.) continued intermittently to investigate cases in England, and in the last two years has examined, through the courtesy of Sir Pendrill Varrier-Jones, the bacilli from every new case of phthisis admitted to Papworth Settlement. These recent English investigations have resulted in the discovery of two further cases with bovine bacilli in the sputum. Both of these patients are males and have lived in Cambridgeshire all their lives. One is a farm labourer 59 years of age, and the other is a youth of 22, the son of a farmer. The number of cases from Papworth examined during the years 1929–32 is 430, making, with those previously reported from London, a total for south-east England of 657. Of these four only, two from Brompton Hospital and two from Cambridgeshire, have yielded bovine bacilli (a full account of the second Cambridgeshire case, Case 25, has not yet been published).

Until very recently no systematic investigations of the types of tubercle bacilli in phthisis in the northern counties of England have been undertaken. This want has been supplied by the important work of Cumming and Foster,[5] of Grassington Sanatorium, Yorkshire, briefly referred to at the centenary meeting of the British Medical Association, and published more fully in the current number of the *Journal of Pathology and Bacteriology*. These authors report that during the period from January, 1931, to September, 1932, they have obtained cultures of tubercle bacilli from the sputum of 339 phthisical persons from the north of England, and that of this number 12 had bovine tubercle bacilli in the sputum. In one instance both human and bovine bacilli were obtained from the sputum, and subsequent bacteriological examination of autopsy material showed that tubercle bacilli of both types were present together in the lung and bronchial mesenteric and cervical glands. In addition to the northern cases, Cumming and Foster examined 52 cases of pulmonary tuberculosis in children under 16 years of age from south-east England and found bovine tubercle bacilli in two instances.

Since our last joint report on this subject in 1932 [6] we have continued to investigate the frequency of bovine infections in phthisis in Scotland and have widened our collecting area to include the districts served by East Fortune Sanatorium in the east of Scotland and Lochmaben Sanatorium in the south of Scotland. As in each of these institutions we have already found several cases of phthisis with bovine bacilli in the sputum, as well as additional cases from Glenlomond, we think it desirable, in view of the findings of Cumming and Foster, to publish without delay the cases we have so far confirmed, with the object of calling special attention to the number and wide distribution in this country of cases of phthisis of bovine origin. Although there is now general recognition of the fact that bovine bacilli frequently cause the non-pulmonary forms of tuberculosis in children, the possibility of these bacilli causing phthisis in adolescent or adult age after an infection in childhood has been regarded hitherto as very remote. Evidence is accumulating that, on the contrary, pulmonary phthisis due to bovine tubercle bacilli is often, perhaps usually, a late manifestation of an infection of alimentary origin acquired in childhood.

Results of Further Investigations

From June, 1931, to the end of 1932 we have obtained cultures of tubercle bacilli from the sputum

of 222 cases of phthisis pulmonalis, of which 70 were from Glenlomond, 88 from East Fortune, and 64 from Lochmaben Sanatorium. We are greatly indebted to Dr. C. Cameron, medical superintendent of East Fortune, and to Dr. G. W. Elder, medical superintendent of Lochmaben Sanatorium, for supplying us with specimens of sputum and for allowing us to consult the clinical records of the cases and personally to examine several of the patients.

The strains obtained from 212 of the cases exhibited the characters of tubercle bacilli of the human type, 209 of the strains belonging to the eugonic human and 3 to the dysgonic human variety. The latter were tested on the rabbit and proved slightly virulent for this species.

The strains, 20 in number, from the remaining ten cases were identical in cultural characters with bovine bacilli. All these strains were tested on the rabbit by subcutaneous, and in some instances also by intravenous, inoculation and produced in one or more animals rapidly fatal general tuberculosis indistinguishable from that which follows inoculation of standard bovine tubercle bacilli. One strain was tested on the goat and proved fully virulent for this species also.

Of the ten cases of bovine phthisis two were from Glenlomond, four from East Fortune, and four from Lochmaben Sanatorium.

Three have died and autopsies were made on two. In one instance (No. 27) the patient died before the type of infecting bacillus had been determined, and only a partial autopsy was made. The channel of the infection therefore was not determined. The occurrence in the case however of enlarged glands before the onset of phthisis indicated that the channel of infection was probably the alimentary canal.

At the second autopsy (Case 29) no tuberculous lesions were found in the neck glands or in the abdominal organs or lymph glands. The tuberculous disease was apparently confined to the thoracic cavity. There had been clinical indications of a cerebral tuberculoma in the left frontal lobe, but this could not be confirmed as permission to examine the brain was not granted. The intertracheobronchial glands, particularly the right, showed caseation, but there was no lesion in the lung which could be regarded as primary, the distribution of the pulmonary lesions suggesting rather a root-spread type of disease.

Though the anatomical evidence as to the portal of entry of the bacilli was inconclusive, it should be noted that this is the first autopsy on a case of bovine phthisis in which there were no signs of disease in the glands of the alimentary tract older than the pulmonary lesions. As the woman was a farm-worker and came as milker into close contact with cows this may be an example of infection with bovine bacilli through the respiratory tract, the vehicle of infection being, as suggested by Bruno Lange, dust from the hides of cows or arising in the shippons, or droplets sprayed by a cow suffering from tuberculosis of the lungs.

More autopsies on cow-contact cases and cases in which clinically there was no evidence of alimentary infection are clearly desirable and will be necessary to settle the question whether human phthisis pulmonalis can be produced by air-borne bovine bacilli.

Case Records

The clinical particulars of each of the ten bovine cases and the results of the bacteriological investigations of the strains isolated may be summarised as follows.

CASE 26.—Female, aged 32, domestic servant. Home address, Kirkpatrick Durham, Kirkcudbright, admitted to Lochmaben in August, 1931.

Patient was healthy as a child, except for measles at 5, and never complained until after she was 16 years old. From 16 to 21 she had amenorrhœa and was easily tired. She married at 27 and has two children 6 and 5 years old. She was notified as a case of phthisis pulmonalis after the first child and lost her voice about a year ago. She liked milk and had been in the habit of drinking it raw, but she has not had enlarged cervical glands or symptoms of abdominal tuberculosis. Her father, a gardener, died five years ago at the age of 60; he had a cough for several years, diagnosed by his doctor as bronchial catarrh. One sister, aged 24, one brother, aged 21, and one sister, aged 29 years, died of "acute tuberculosis" in December, 1914, December, 1918, and April, 1930, respectively. Three sisters are alive. The mother died a year ago at age of 70.

In July, 1932, her condition was as follows: very thin, pale, breathless, not febrile, pulse about 100, speaks in a hoarse whisper. The X ray examination showed on left side, extensive infiltration with appearance of much breakdown in upper lobe, pleura thickened, and heart pulled over; on right side, shadow increased at root, spreading out into upper lobe, which was infiltrated and showed some evidence of breaking down. Dr. Elder thinks that it is undoubtedly an infection spreading from the roots.

Cultures of tubercle bacilli were obtained directly from the sputum in December, 1931, and in January and May, 1932. The three strains were dysgonic. Each strain was tested subcutaneously on the rabbit. The three rabbits died in 78, 100, and 53 days respectively of typical severe generalised tuberculosis.

CASE 27.—Female, aged 35, housewife, admitted to East Fortune in June, 1931. Home address, Middlemaens, Pencaitland, East Lothian.

Two years ago she had enlarged cervical glands which discharged. In December, 1930, she had a bad influenzal cold and cough was severe for some time, but she was able to do her housework. In February and March, 1931, she felt better, but at the end of March she had another attack of "influenza." From that time she became thinner and weaker and cough has been persistent and severe with copious sputum. On admission firm glands were palpable in both posterior triangles and supraclavicular areas, and there was a scar from a glandular abscess which healed two years ago. The lung signs were those of extensive fibrotic disease of the left lung consolidatory in nature with areas of activity in the upper lobe; there was less dense but also active disease of the upper half of the right lung. Dr. C. Cameron thought the disease had been in existence at least two years. A radiogram showed upper third of left lung honeycombed with cavities and many cavities in the upper and middle lobes of the right lung and infiltration of lower lobe. She died in February, 1932. Unfortunately the type of infecting bacillus had not then been ascertained and only a partial necropsy was made. Both lungs were densely adherent, the upper lobe of the left being completely excavated and containing pus; the lower lobe was densely fibroid and contained multiple cavities; there was fibroid disease with multiple cavities in upper half of right lung.

A culture of tubercle bacilli was obtained directly from the sputum in January. The strain was dysgonic and virulent for rabbits.

CASE 28.—Female, aged 25, housewife. Home address, Linlithgow, West Lothian. Admitted to East Fortune in October, 1931.

She had pneumonia between 6 and 12 years of age and "influenza" at 13 or 14. In 1926 her appendix was removed, but no mention in records of abdominal tubercle. She then remained well until January, 1930, when she took what she described as a chill followed by loss of appetite, loss of weight, and general weakness. Her history afterwards was the usual oscillating one, sometimes fairly well and sometimes ill with fever, headache, and general malaise, and at intervals pleural pain. There is no family history of tuberculosis. She has one boy aged 3 who is well.

On admission her general condition was poor; fairly severe cough; sputum purulent, 1 oz. daily, contained tubercle bacilli in small number, one or two per field.

Physical signs indicated disease of whole left lung with softening in progress about central area; fibrosis of right lung with restricted disease of apex of upper lobe which showed evidence of a small cavity and a fine subclavicular infiltration. The X ray examination showed on left side a large area of dense perihilar consolidation with a spread of a lighter nature towards periphery. Dr. Cameron stated that this particular picture of dense perihilar disease is not common in lung tuberculosis. In November, 1931, a left artificial pneumothorax gave a small partial collapse. In February, 1932, the patient was afebrile with normal pulse, cough practically absent, and sputum scanty but still containing tubercle bacilli; left lung fibrosing and pulling heart over.

Cultures of tubercle bacilli were obtained directly from the sputum in December, 1931, and January, 1932. Both strains were dysgonic and highly virulent for rabbits inoculated subcutaneously.

CASE 29.—Female, aged 33, farm-worker, admitted to Lochmaben on March 1st, 1932.

She was born on a farm in Kirkbride, Cumberland, and did all sorts of work, including milking the cows and making butter. She had no illness until ten years ago, when she had spasms of abdominal pain and according to her doctor was threatened with appendicitis. She lost 1 st. in weight which she did not regain. She began to cough in January, 1932, and about that time contracted a very bad cold which pulled her down. She came to her sister in Scotland for a change and was there recognised as a case of pulmonary tuberculosis. On the farm a cow with tuberculosis of the udder was destroyed a year ago. Mother died three years ago of heart trouble; father, one brother, and two sisters alive and well.

On admission the patient looked pale and thin, and there was slight systemic disturbance. X ray examination showed pleural effusion of lower third on left side with much pleural thickening above, obscuring lung. On right side infiltration about the root spreading up to upper lobe, with suggestion of breaking down about middle of lung, and also nodular spread into lower lobe.

Cultures of tubercle bacilli were obtained directly from the sputum in May and June, 1932. Both strains were typically bovine in cultural characters and in virulence for the rabbit.

Autopsy.—The woman died on Nov. 24th, 1932. At the autopsy Dr. Elder found no signs of tuberculosis in the abdominal organs or glands. The mesenteric glands were examined at Cambridge and were free from lesions. The appendix was fibrosed and bound down by adhesions to the brim of the pelvis. There were no enlarged glands in the ileocæcal region or in the neck.

The right pleural cavity was free from disease. On the left side the pleural membranes were thickened and adherent in the lower two-thirds. The base of the left lung was firmly adherent to the diaphragm at its outer margin and between the diaphragm and the lung there was a thin layer of thick pus. At the base of the lung five subpleural nodules were seen; they were almond-shaped and approximately $2 \times 1 \times \frac{1}{2}$ in. Lungs: from the root of the right lung fibrocaseous disease extended outwards affecting about two-thirds of the organ. The spread was fairly uniform in all directions and did not reach the periphery at any point. There were numerous cavities; the larger (about $\frac{1}{2}$ in. diameter) were at the root and the excavations and caseous parts diminished in size from the root outwards. A similar condition was found in the left lung but the spread was not so uniform; it did not extend so high up but it reached the periphery and the base where the nodules previously mentioned were found. There was more cavitation in this lung.

The bronchial glands were examined at Cambridge. They were coal black. The prætracheo-bronchials showed no lesions. The intertracheo-bronchial on the right side was enlarged 3·5 cm. in length and 1·5 cm. in diameter, capsule thickened, and half or more of its substance was caseated. The corresponding gland on the left side contained a caseous nodule the size of a hempseed. Further along this bronchus, within the hilus, there was a pea-sized partly caseous gland and another just beyond showed a narrow part of the cortex opaque.

The definitely intrapulmonary glands on both sides were intensely anthracotic but showed no tuberculous lesions.

CASE 30.—Female, aged 27, domestic servant, born in Dumfriesshire. Admitted to Lochmaben in March, 1932.

No illnesses in childhood, at 19 years "rheumatic fever" and still suffers from pains in the joints, but there is no cardiac damage and quite recently she had a rash on the legs and arms lasting three days. Two years ago had an attack of influenza and lost weight which has not been regained. For the last two to four years she has not felt fit. She has always been fond of milk.

The X ray examination showed on right side well-marked root-spread along interlobar pleura with infiltration into upper and lower lobes and some evidence of breaking down in lower part of upper lobe; on left side increased root shadow with little or no evidence of infiltration.

Cultures of tubercle bacilli were obtained directly from the sputum in May and June, 1932. Both strains were dysgonic, and produced progressive general tuberculosis in rabbits. One strain caused general tuberculosis in a goat after subcutaneous inoculation, the animal dying in 58 days.

CASE 31.—Female, aged 28 years, domestic servant Admitted to East Fortune in February, 1929.

She was born in Midlothian, was fond of milk, and had enlarged glands in the neck in early childhood. On admission there were clusters of enlarged glands like small beans in the lower third of the left posterior triangle and in the left axilla; she had a cough and her sputum contained tubercle bacilli. X ray examination showed definite infiltrating tuberculosis of left upper lobe with thickening along upper part of root spreading out along septum; also evidence of infiltration into right lower lobe. Radiogram of spine showed doubtful compression of two lower dorsal bodies but no evidence of active spine disease. Laryngoscopic examination showed extensive infiltration of both vocal cords.

She improved very much and was discharged at her own request in November, 1929, having gained 7 lb. in weight (8 st. 8½ lb.); the sputum was negative. Three months later she began work as domestic servant and worked for 15 months. In April, 1931, her sputum was blood-stained and she gave up work on account of breathlessness. She became progressively more dyspnœic and was readmitted on May 28th, 1932; the sputum was laden with tubercle bacilli, mainly short.

X ray examination showed whole left lung involved in dense disease with extensive thick-walled cavities in left upper lobe; lighter infiltration of good definition in right upper lobe; calcified glands in neck. She slowly went downhill, and on Oct. 7th, 1932, asked to be allowed to go home, where she died a week later.

Cultures of tubercle bacilli were obtained directly from the sputum in June and September, 1932. Both strains were dysgonic and produced severe and rapidly fatal progressive general tuberculosis in rabbits inoculated subcutaneously.

CASE 32.—Female, aged 21, housewife. Home address, Cardenden. Admitted to Glenlomond in October, 1931.

She had no illnesses in childhood and from 14 years of age for six years worked on a farm as a milker and outworker. She drank a good deal of milk and she stated that during the last three years of her employment there was a cow which was a "piner" and was killed on the farm. She married at the age of 19 and has a child of 16 months. Her illness began in August, 1931, with a bad cold, and cough with a little sputum developed later. She began to get hoarse in September.

On admission X ray examination showed left lung infiltrated with signs of cavities in upper lobe. Small glands were felt in the posterior triangles. In December, 1931, artificial pneumothorax was done, giving a complete ribbon collapse of lung. Subsequently she improved continuously, cough and sputum subsided, and on May 28th, 1932, she was discharged, her general condition being very good.

A culture of tubercle bacilli obtained directly from the sputum in 1931 was dysgonic and virulent for rabbits.

CASE 33.—Female, aged 11.

She was breast-fed for three to four months, and then was brought up on Nestlé's condensed milk and oat flour until the age of 13 months. Subsequently she was given raw cow's milk. Enlarged glands in the neck were first noticed when she was 20 months old. The child was first admitted to Glenlomond Sanatorium in September, 1928, when she was 7 years old. Four months previously enlarged glands had been excised from the right side of the neck and the

incision, 2½ in. long, was still not completely healed. Many small glands could be felt on both sides of the neck, and on palpating the abdomen enlarged glands (?) could be felt in the right iliac fossa. There were numerous enlarged venules over the chest but no active lesion was found in the lungs. Both eyes showed corneal nebulæ. The child had slight systemic disturbance, did not improve much, and was taken home in June, 1930. She was readmitted in October, 1932, thin and ill, temperature 100°, pulse 110, with small softened glands on both sides of neck, and evidence of active intestinal ulceration. There was also extensive disease of the lungs, more on the right than on the left side; on the right side the right upper lobe was chiefly affected and on the left there was a root-spread type of disease. The sputum contained tubercle bacilli. Early in January, 1933, a caseous and softened gland was excised from the neck.

Cultures of tubercle bacilli were obtained directly from the sputum on four occasions, twice in November, and twice in December, 1932. All the strains were dysgonic and highly virulent for the rabbit. Cultures were also obtained from the cervical gland, directly and through the guinea-pig. Both strains are dysgonic but have not yet been tested on the rabbit.

CASE 34.—Male, aged 17, of Linlithgow, West Lothian. (Clinical notes by Dr. C. Cameron.)

The patient was admitted to East Fortune in September, 1932, for treatment of advanced tuberculosis of the lower part of his spine. He stated that at the age of 3 he fell out of a railway wagon and hurt the foot of his back but it was impossible to determine whether or not this had anything to do with the present condition. The first definite treatment which he received for spinal tuberculosis was nine years ago (he was then eight years old) when he had treatment of some kind for six months in a Lanarkshire hospital. The disease must have been well established since there was some stiffness of the legs. He attended school again and so far as could be determined finished his school period. He had been confined permanently to the house during the six months preceding his admission to the sanatorium.

His condition on admission was deplorably bad. He was pallid, emaciated, and weak. His skin was harsh and dry, and he had the appearance of suffering from advanced active tuberculous disease. There was a sharp gibbus involving the lower lumbar spine and part of the sacrum, a radiogram showing advanced destructive tuberculous disease of the fourth and fifth lumbar vertebræ and upper part of the sacrum with extensive abscess shadowing, largely calcified, spreading around the lower lumbar spine and into the pelvis. No one appears to have examined his lungs, although he had passed through a surgical ward of an infirmary. I found him to have advanced and dense fibrocaseous disease involving practically the whole of his left lung. The left diaphragm was caught and raised by adhesions. He had similar disease of the right upper lobe again containing several cavities with some lighter infiltrative disease of the lung below. We obtained from him with difficulty a scanty sputum in which a few tubercle bacilli were found. The sputum was brought up at intervals, sometimes scanty but densely purulent, at other times watery and containing purulent streaks. He has remained irregularly febrile but his condition has undergone very definite improvement.

Until within the last year he practically never got milk apart from that given in tea. A brother, aged 13 years, had tuberculous neck glands excised three years ago, since when he has been well.

Pure cultures of bovine tubercle bacilli were obtained directly from the sputum in September and October, 1932. Both strains were fully virulent for the rabbit.

CASE 35.—Female, aged 28, housekeeper. Admitted to Lochmaben Sanatorium in December, 1932. The full clinical particulars and bacteriological results in this case are not yet available.

Summary

The number of cases of phthisis pulmonalis with bovine tubercle bacilli in the sputum reported in England and Scotland has now reached the startling figure of 49.

The majority of these cases, namely 45, have been discovered within the last ten years. We cannot say whether this large addition indicates an increase in the proportional frequency of bovine phthisis in recent years or not, since most of the cases were found in parts of the country where investigations had not previously been made.

From a comparison of the findings in different parts of the country it would appear that phthisis due to bovine bacilli is less frequent in the south of England than in the north of England and in Scotland. The bovine percentages for these different regions are 0·6, 3·8,* and 3·9 respectively.

The ages of the patients when the bovine bacilli were found in the sputum ranged from 7 to 59 years. They were distributed in the various decennial age-groups, as follows:—

0– 9 years	1 patient,	7 years old.
10–19 „	12 patients,	8 of them 17 to 19 years.
20–29 „	25 „	14 „ „ 20 to 25 „
30–39 „	6 „	
40–49 „	4 „	
50–59 „	1 patient.	

The majority of the patients were therefore adolescents and young adults.

Of the 49 patients, 31 were females and 18 were males. At least 20 of the patients gave a history of enlarged glands in the neck or of abdominal trouble before the onset of phthisis pulmonalis. In the remainder no history of glands in the neck or symptoms suggestive of abdominal tuberculosis was elicited, but it may be mentioned that an autopsy on one of these cases showed the primary lesions in the mesenteric glands.

Generally there was a history of cough and sputum for one or two years before admission to the sanatorium, but in some instances there was a longer history, and one of Cumming's cases was known to have had positive sputum ten years before the bacteriological investigation established the type of bacilli present in the sputum. Some of the patients are still alive, five to nine years after the bacilli in the sputum were identified as bovine. It is remarkable in view of this fact that none of the cases, so far as we have been able to ascertain, has transmitted the infection to another human being, and that with two possible exceptions none of the cases appears to have acquired the infection from a previous human source.

Six of the cases were in persons who, in their employment on farms as milkers, &c., came into close contact with cattle. One of these persons, a woman aged 33 years, died, and an autopsy was made. No lesions were found in the lymph glands of the alimentary tract, but there was caseation of the glands at the bifurcation of the trachea. This may not be quite enough to enable us to affirm that the infection was of respiratory origin.

Twenty-two of the patients have died, the duration of life after the bacilli were identified ranging up to five years. Autopsies were made in six instances. The examinations were not in all cases complete, but in three instances the anatomical evidence was definitely in favour of the alimentary tract as the portal of entry of the bacilli.

The work is continuing, and we reserve a full discussion of the results until the investigations are completed, when, in collaboration with Dr. Cumming, we propose to collect together in one report all the facts ascertained in this important group of cases.

* The case from Cumberland (No. 29) in our series has been included in Cumming's figures for the North of England.

Conclusions

1. The bovine tubercle bacillus is a more frequent cause of phthisis pulmonalis in Great Britain than is generally supposed.

2. Phthisis pulmonalis due to bovine tubercle bacilli is often a late manifestation of an infection acquired in childhood through the channel of the alimentary tract.

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MONOCYTIC LEUKÆMIA: TWO CASES

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Anomalous types of white cells are often found in the blood in cases of acute and subacute leukæmia, more especially when the total leucocyte count is not greatly increased. In practice the problem is most frequently that of discriminating between myeloblasts and lymphoblasts, and it is sometimes difficult or impossible to make this distinction with certainty. The question is further complicated by the fact that in the literature cases are to be found in which the authors are convinced that the characteristic cell is related to the monocyte or large hyaline leucocyte. Hæmatologists are not agreed as to the existence of a true monocytic leukæmia, and the following two cases are therefore reported in some detail.

THE FIRST CASE

A stableman, aged 40, was admitted to St. Mary's Hospital in September, 1930, complaining of constriction of the neck, and attacks of giddiness and pain radiating into right neck. The family history was unimportant. He had had malaria during the late war. General weakness and swelling of face and hands had begun in the previous April, and had increased since then. He ascribed the illness to the removal of teeth in April. On examination he was pallid, feeble, with some dilatation of the veins of the neck, and puffy hands; a blood count (see Table I.) showed a marked leucopenia, especially of the polymorphonuclear leucocytes.

The condition was diagnosed as myxœdema, and subsided, with great alteration in the facial and cervical contour, as a result of treatment with thyroid gland. He was discharged at his own desire and returned to work but failed to continue with the thyroid, reappearing in the out-patient department with more œdema and weakness. In hospital for three weeks (December, 1930) he once more improved with thyroid. After returning to work he experienced considerable dyspnœa, palpitation, anorexia, great weakness, nausea, headache, giddiness, numbness, and tingling in the hands.

On June 15th, 1931, he was readmitted to hospital for the last time. Three weeks previously pain had developed in the left axilla. He was pale and sallow, looked very ill, and slept most of the day; the eyebrows were scanty. Temperature 101° F., later 104° F. and irregular; pulse 80 to 100, rapid and soft; respirations 22 per minute, deep and regular; blood pressure 120/60. A gland, the size of a pigeon's egg, was found in the left axilla, this caused him much pain and later developed into an abscess which opened (July 13th) and drained, staphylococci being recovered from the pus. X rays showed no evidence of any definite pulmonary disease.

On August 11th the condition was much improved, except that a discharge had developed from the antra which were drained on August 18th and again on the 21st. It was noted on the 29th that the skin seemed to have coarsened lately. Multiple small cutaneous "abscesses" began to develop from this time; these were painless and formed indolent craters with yellow pus from which *Staphylococcus aureus* was grown. Blood culture was negative.

Blood transfusion on Sept. 21st, 1931, was followed by a rigor and led to no permanent improvement. The liver first became palpable on Sept. 15th, enlarged to two inches below the costal margin. By the 25th the general condition showed a marked deterioration and albumin appeared in the urine. He complained of aching in the eyes, which was relieved by wearing deep blue glasses. On Oct. 2nd the back and neck were covered with cutaneous abscesses and X rays showed empyema of both antra, the left frontal sinus being also suspect. The antra were drained (Oct. 6th) and the general range of temperature became more limited, but his condition became progressively more lethargic, and he developed secondary broncho-pneumonia and died on Oct. 13th.

TABLE I.—*Blood Counts in Case 1*

	1930	1931				
Date	22/9	17/6	17/7	13/8	3/10	15/10
Red cells, millions per c.mm.	3·48	2·30	2·15	2·20	2·14	—
Nucleated red cells per c.mm.	—	—	100	A few	600	—
Hæmoglobin per cent. ..	70	36	38	36	34	—
Colour-index	1·0	0·8	0·9	0·8	0·8	—
White cells per c.mm. ..	1800	5000	5000	4500	8000	10,000 approx.
Polymorphs	25%	9%	9%	—	4%	1%
Myelocytes	1%	1%	—	—	—	—
Lymphocytes	56%	19%	12%	—	19%	26%
Lymphomonocytes	10%	6%	18%	—	8%	6%
Monocytes	8%	65%	57%	—	66%	66%
Ghosts	—	—	4%	—	3%	1%
Oxidase-positive WBC ..	—	—	—	51%	15%	68%

The *blood counts* are detailed in Table I. The cells classified as monocytes showed a considerable histological variation from the large hyaline leucocyte of the normal blood. In the later films they were large cells, averaging 15 to 20 microns in diameter, with (in Leishman preparations) muddy-blue cytoplasm frequently thrown out into pseudopodia and showing a varying amount of granulation. The granules had the staining reactions of "azur" granules, but in the later films were much more numerous than in normal cells; they were generally round dots but many were short rods. Not infrequently the cytoplasm was vacuolated. The nuclei were round, indented, reniform, or horseshoe shaped, but never showed true lobation; for the most part their chromatin had a uniform finely woven reticular pattern, but very occasionally nucleoli were present. The nuclei sometimes showed vacuolation similar to that seen in some of the lymphocytes. The oxidase reaction of the monocytes, as is apparent from the differential counts, was inconstant, and when positive the intensity of the reaction was variable. The lymphocytes showed much variation in the staining of their cytoplasm and nuclei, the latter frequently being fenestrated in a manner recalling the appearances of the blood film in glandular fever. The range of variation was so great that in the case of a number of cells it could not be stated with confidence whether they were monocytes or lymphocytes; such cells have been arbitrarily classified as lymphomonocytes. The rare examples of polymorphonuclears found in all the films were in every way typical. Supravital staining (Oct. 6th 1931) showed

33 per cent. of white blood-cells giving the reaction of monocytes.*

NECROPSY

Body thin and poorly nourished (weight 48 kg.). All tissues anæmic. Two sinuses leading from abscesses in the left axilla; abscesses also present in the right axilla, left side of neck, and over lower end of sternum. The skin of the whole body covered with brownish spots about 1 cm. average diameter, most of which showed a central scab of pinhead size.

Heart normal size, parenchymatous degeneration of myocardium; very little atheroma in arteries. Trachea and bronchi contained a little thin, frothy, slightly blood-stained fluid; 150 c.cm. clear fluid in each pleural sac. Right *lung* anæmic, with emphysema and œdema; bronchopneumonia with peribronchial hæmorrhagic areas and in many places confluent, of the left lower lobe, and recent fibrin on its pleural surface. Mouth, tongue, and pharynx normal; tonsils enlarged with a greenish tinge on section; in the posterior wall of the *œsophagus*, 6 cm. below the bifurcation of the trachea, there was an oval dark rough granular area surrounded by a hæmorrhagic ring (2 × 1 cm.); on section this was superficial and its base consisted of a black line; just below it a similar smaller lesion. Stomach and small intestine normal. *Colon* showed dark brown pigmentation of mucosa which gave a positive Prussian-blue reaction, also a definite increase in the lymphoid tissue. Pancreas normal; lipoid deposits in the mucosa of gall-bladder.

The *liver* was markedly enlarged (2520 g.) and had a pinkish-brown colour. On section the lobular pattern was clear in some parts and blurred in others. The peripheries of the lobules contained fat, the centres were darker than normal, and the portal systems were unusually conspicuous. On treatment with potassium ferrocyanide and hydrochloric acid a well-marked Prussian-blue reaction was given, indicating the presence of free iron.

The *spleen* was somewhat larger than normal (270 g.), œdematous, and had a definitely brownish colour. The Malpighian bodies were smaller than normal, the fibrous trabeculæ somewhat more obvious than usual. Free iron was present.

All the *lymph glands* in the body showed a substantial increase in size. On section they were of a greenish colour with red and yellow mottling; some of them had a granular appearance; they contained free iron. The *bone-marrow* of the femur was red throughout the medullary cavity. In the upper part of the shaft it was a dull greyish-red and rather granular, in the lower part dark glossy-red and gelatinous in appearance.

The thymus was replaced by fat and fibrous tissue; left suprarenal small with thin cortex, right normal. *Thyroid* only slightly smaller than normal; on section white, tough, and fibrous. The *kidneys* were pale and œdematous, on section both the cortex and medulla swelled appreciably; the cortical pattern was clear in some places, blurred or lost in others. Right ureter double as far as the brim of the pelvis. Bladder, prostate, and testes normal.

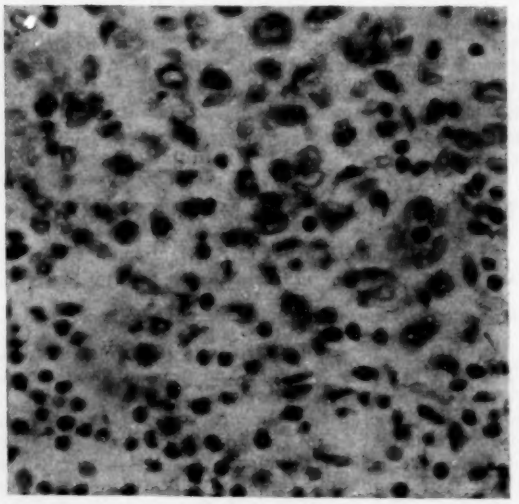
Examination of the head was not permitted.

HISTOLOGY

Lymphatic glands.—Several glands from the aortic, deep cervical, and mesenteric groups were examined, and all show numerous large mononuclears (which will in future be referred to as monocytes) infiltrating the gland substance and obliterating the pattern to a greater or less extent. These cells are large irregular cells, the cytoplasm of which stains slightly more with eosin than the normal reticulum cells. The nuclei are more or less round, with a well-marked nuclear membrane and though many show acidophil nucleoli, the latter are more usually absent. They are most numerous in the subcapsular lymphatic space and in the sinuses of the medulla, but all regions of the gland are invaded to some extent. Many of them contain much altered blood-pigment which gives a positive reaction for iron and occasionally there are ingested erythrocytes. In frozen sections a large number of oxidase-positive cells can be found, although polymorphs are conspicuously absent. Some of the monocytes show a coarse eosinophil granulation; this is particularly marked in large irregular cells lying in the pericapsular fibrosis around the aortic and cervical glands. A few multinucleated monocytic forms are seen, as well as occasional megakaryocytes (Fig. 1).

Spleen.—The Malpighian bodies are small and mis-shapen. The pulp is uniformly œdematous and the pattern is practically indiscernible, as a result of the presence of large numbers of monocytes comparable with those in the lymph glands and showing similar variants. There is a very large amount of iron-containing pigment in the pulp, partly in monocytes, and partly in large irregular macrophages which may be identical. Polymorphonuclears are absent, but the pulp contains numerous oxidase-positive elements.

FIG. 1



Lymph gland from Case 1; upper and lower parts of field mostly monocytes and lymphocytes respectively. (× 500.)

Liver.—General œdema. Fat is present in large amount, especially in the peripheral half of the lobules, the cells of which are distended with large droplets. The interlobular veins are dilated, and their blood contains many large mononuclears. Monocytes are scattered loosely and uniformly throughout the sinusoids. They are similar to, if slightly smaller than, those in other tissues, but show more variation in shape of nuclei. Some of them are drawn out in cytoplasmic processes and applied to the capillary walls like Kupffer's cells, and the distinction between the two cannot always be made apart from the oxidase and Prussian-blue reactions. Iron is present in large amount in the Kupffer's and the liver cells of the central zone of the lobules, to a less extent in the peripheral liver cells, and to a slight extent in the monocytes. The monocytes give a well-marked oxidase reaction.

Bone-marrow.—The fat is almost completely replaced by œdematous cellular tissue. Its cytology is unusually uniform, as nearly all the nucleated cells are monocytes, with only a few erythroblasts and an occasional megakaryocyte. The monocytes are similar to those found in other places but a few mitoses are observed, such cells having a more eosinophil cytoplasm. There is a number of multinucleated cells not unlike the Dorothy Reed type. Myelocytes and polymorphs are absent. Nearly all the monocytes give the oxidase reaction, in some it is weak and indefinite, but in fully half of the cells it is well marked. The oxidase-granules, however, are considerably less numerous than in true granulocytes. Much hæmosiderin is present.

Thyroid.—The gland is replaced by dense fibrous tissue and vessels, with numerous lymphoid foci and a few scattered atrophic epithelial tubules. Slight proliferation of elastic tissue around blood-vessels and tubules (Fig. 2).

Lung.—Broncho-pneumonia, the exudate being mainly composed of fibrin and monocytes, with very occasional polymorphonuclears. Necrosis in centres of foci of consolidation, œdema between them.

Kidney.—Cloudy swelling. A few monocytic foci in the connective tissue round the arcuate vessels.

Tonsil.—Numerous monocytes in the deeper layers.

Œsophagus.—Ulceration and necrosis (probably partly post mortem) with karyolysis and colonies of moulds on the mucous surface. Below this a wide zone of monocytes, and then some fibroblastic proliferation. No polymorphs.

* I do not use Sabin's method of supravital staining exactly as described by her, since we have no hot-box in the laboratory. The slides are prepared in the same way as that employed by Sabin, with a thin film of neutral red (with or without Janus green); the blood is taken in the same way; but after vaselining the edges of the cover-slip the slide is placed in the incubator, and removed for microscopical examination from time to time. If this is done fairly quickly I find that the cells remain alive long enough to show the characteristic phagocytic properties of the monocyte.

Two skin nodules.—Aggregations of monocytes in the dermis with necrosis of the central parts of the nodule.

Colon.—Macrophages containing coarse granules of iron pigment in stroma of mucosa.

THE SECOND CASE

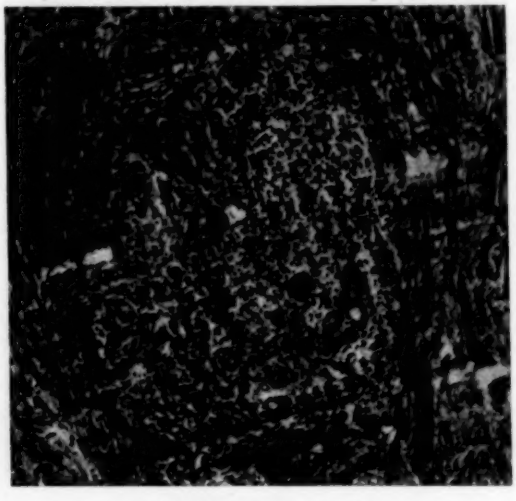
An upholsterer, aged 71, was in bed for three weeks with influenza in February, 1932, and this was followed a week later by a severe attack of vomiting and diarrhœa lasting four days. When he was seen in the out-patient department on April 14th his appetite was poor, and he had been losing weight and becoming increasingly pale. On admission

TABLE II.—*Blood Counts in Case 2*

Date in 1932—	14/4	28/4	9/5	10/5	19/5	20/5
Red cells in mills...	2·68	1·96	—	1·88	1·50	—
Nucleated red cells	—	—	400	—	—	—
Hæmoglobin ..	54	40	—	36	26	—
Colour-index ..	1·0	1·05	—	1·0	0·9	—
White cells ..	35,200	4,400	18,800	6,200	140,000	—
Polymorphs ..	12 %	11 %	21 %	—	2 %	4 %
Lymphocytes ..	8 %	33 %	15 %	—	4 %	6 %
Lymphomonocytes	—	12 %	11 %	—	6 %	6 %
Monocytes ..	80 %	44 %	53 %	—	88 %	84 %
Oxidase-posit. WBC	—	—	25 %	—	18 %	—

to St. Mary's Hospital (April 18th) he was pale, feeble, and noticeably drowsy. The liver was slightly enlarged, the spleen not palpable, and the heart showed some dilatation with hæmic murmurs. Achlorhydria was present, and a trace of occult blood in the fæces. X rays showed no alimentary

FIG. 2



Thyroid from Case 1. (× 100.)

abnormality. He ran an irregular fever and gradually lost weight and strength, dying on May 21st.

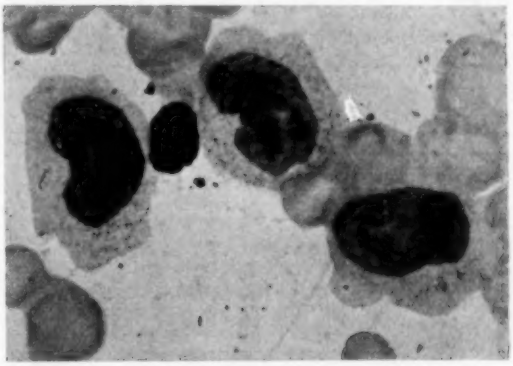
The blood counts are shown in Table II. The monocytes were large cells of morphology similar to those of Case 1, with muddy cytoplasm and pseudopodia, and finely reticular reniform or round nuclei, sometimes fenestrated (Fig. 3). In the films of May 19th two such cells were seen in mitosis, and on the 20th two of them contained an ingested red corpuscle. Supravital staining with neutral red demonstrated their characteristic phagocytic activity. Their oxidase reaction was inconstant but generally negative.

NECROPSY

Nutrition poor. Rigor passing off, greenish discoloration of anterior abdominal wall. Subcutaneous fat very small in amount.

Heart.—Slight, very recent, terminal fibrinous pericarditis. Subpericardial petechiæ, and a few dark pink leukæmic nodules (0·1 cm. diameter) on surface of heart. Myocardium soft and flabby, having a yellowish tinge on the endocardial surface with slight "tabby-cat" marking. Endocardium and valves normal. Much typical leukæmic clot in chambers of heart, pulmonary artery, and veins. Atheroma remarkably slight for age.

FIG. 3



Blood film from Case 2, showing three monocytes and a small lymphocyte. (× 1300.)

Larynx, trachea, and bronchi normal. Œdema, emphysema, and hypostatic congestion of *lungs*.

Tongue heavily furred, marked increase of lymphoid tissue at base. Tonsils enlarged, œdematous, and homogenously fleshy. Pharynx and œsophagus normal. Submucous myoma (0·7 cm. diameter) in anterior wall of stomach, 3·5 cm. from cardiac orifice. Multiple ulcers of *small intestine*—most of them were irregular patches covered with a fibrinous membrane of diphtheroid type; in the ileum they frequently involved Peyer's patches; in the jejunum a large ragged ulcer with irregular edges and a black base was firmly adherent to the sigmoid colon in the left iliac fossa. Solitary lymphoid follicles of large intestine enlarged (average 0·2 to 0·3 cm.); positive Prussian-blue reaction in entire length of mucosa of colon. Pancreas, gall-bladder, and bile-ducts normal.

The *liver* was enlarged (1870 g.) with post-mortem discoloration of lower edge and posterior surface. On section it was pale in colour and swelled over its capsule. The pattern was obscured, the peripheral parts of the lobules being pale and greyish-white in colour, and the centres brown. It contained free iron, as estimated by the Prussian-blue reaction, in considerable amount.

The *spleen* (510 g.) swelled slightly on section, the cut surface being pale pink and practically devoid of pattern. The Prussian-blue reaction was strongly positive, and after the test was carried out the Malpighian bodies became more readily distinguishable as minute unstained foci.

The *lymphatic glands* were all considerably enlarged, and contained free iron. On section they were generally pale, sometimes mottled with red, but many showed a distinct greenish tinge. The bone-marrow of the femur was red in the upper 30 cm. of the shaft, the colour becoming deeper from above downwards, and fatty with small reddish spots in the lower 10 cm.; free iron was present.

Kidneys slightly enlarged (300 g.), pattern blurred, free iron around the arcuate vessels. Bladder and prostate normal. Testes œdematous, small left varicocele.

Thyroid small, rather tough, with prominent fibrous trabeculæ and little colloid. Parathyroids, suprarenals, and pituitary normal. Thymus replaced by fat.

Brain and meninges normal.

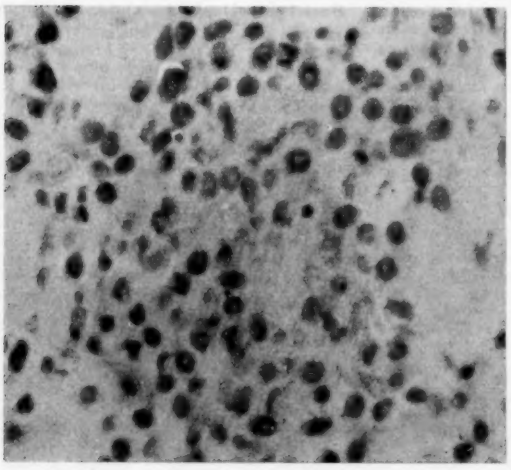
HISTOLOGY

Lymphatic glands.—Cervical, aortic, and mesenteric glands all show changes comparable with those of Case 1, the pattern of the glands being lost to a great extent, and the largest proportion of monocytes being found in the subcapsular and medullary parts of the glands. Mitotic figures are fairly common. The capsules and periadenoid tissues are also infiltrated to some extent, as is the excess fibrous tissue of the medulla of the aortic glands. Some

phagocytosis of red cells. All glands show a high proportion of oxidase-positive monocytes. Iron-containing pigment in small amounts.

Bone-marrow.—Marked hyperplasia of monocytes, slight hyperplasia of erythroblasts, much karyorrhexis. Many of the monocytes are oxidase positive. Iron is mostly

FIG. 4



Subpericardial leukæmic nodule from Case 2; cells are all monocytes, two being in mitosis. (× 500.)

contained in large macrophages and elongated, possibly endothelial, cells, but there is some in the monocytes.

Spleen.—Malpighian bodies very small; pulp packed with monocytes, mostly oxidase positive. Karyorrhexis in scattered foci. Much iron pigment in monocytes and reticulum cells of pulp.

Liver.—Monocytic infiltration most marked in portal systems, gradually becoming less dense as the centres of the lobules are approached. Monocytes generally oxidase positive. Siderosis of Kupffer's cells and liver cells, especially those in the centre of the lobule; less in the monocytes; hæmofuscin also present in considerable quantity. Very little fat, only a few globules in the peripheral cells.

Tonsil.—Monocytic infiltration; mitoses in both squamous epithelial cells and monocytes. Lymphoid tissue in immediate relation to crypts only.

Heart.—Fatty degeneration. Subpericardial periarteriolar nodule consisting of monocytes, several undergoing mitotic division; karyorrhexis at periphery (Fig. 4).

Intestine.—The membranous and ulcerated lesions show a coagulative necrosis involving all layers, the mucosa and muscularis mucosæ especially, and a small amount of fibrinous exudate. The cellular reaction consists almost entirely of monocytes with very few polymorphs. In Peyer's patches the deeper lying lymphocytes are replaced by monocytes.

Thyroid.—Definite degenerative changes are present. The gland is divided into lobules by trabeculæ of fibrous tissue, and finer collagenous fibres surround almost every individual vesicle. The vesicles show great variation in size, but most of them are very small, and are either empty or contain granular material; their epithelial cells are small, more or less flattened, and sometimes deficient. The few normal-sized vesicles contain colloid which generally stains poorly (Fig. 5).

Pituitary and parathyroids normal.

Lung.—Emphysema. Patchy œdema.

Kidney.—Monocytic infiltration in and around the adventitia of the arcuate and interlobular arteries, and around small groups of glomeruli.

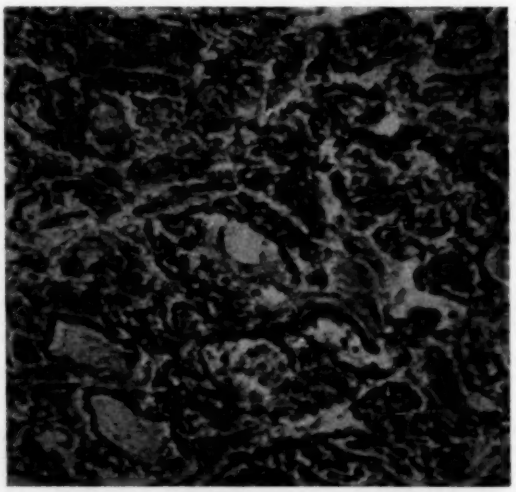
Discussion

These two cases conform to the usual conception of leukæmia in that there was a preponderance of one type of cell in the circulating blood associated with infiltration of the hæmopoietic organs, adult and fœtal, with the same type of cell. In Case 1 the total leucocyte count was at no time appreciably greater than normal, but this is not a serious objection to the use of the term "leukæmia," as many instances are on record in which the leucocyte count has been very low throughout, and it is well known that a so-called "aleukæmic phase" may occur in the course of a leucocythæmia of considerable magnitude. The leucopenia, especially of the granulocytes in Case 1, which was present 13 months before death, suggested the possibility of agranulocytosis, but the literature on this condition contains no comparable case. The granulopenia is, however, of interest, since Weiss (1927) has expressed the belief that every acute leukæmia is preceded by a greater or less degree of hypogranulocytosis.

In both the present cases the essential type of cell is the same. Its morphological characteristics, supravital staining reactions, and (in Case 2) ingestion of erythrocytes prove beyond reasonable doubt that it is related to the large hyaline leucocyte or monocyte.

Reschad and Schilling-Torgau (1913) described a "new leukæmia" characterised by the presence in the blood of numerous cells which were regarded as monocytes by Naegeli and Pappenheim. Their case, in a man aged 33, lasted eight weeks, started with gingivitis, and exhibited rigors, fever, and epistaxis. There was a generalised cutaneous rash consisting of focal accumulations of monocytes and histiocytes, enlargement of the spleen, and free iron in the liver. An ulcer in the large intestine is of interest in that it appears to have been histologically similar to the œsophageal and intestinal ulcers of the present Cases 1 and 2 respectively.

FIG. 5



Thyroid from Case 2. (× 100.)

Dameshek describes two cases and surveys the literature, coming to the conclusion that it contains 18 proven cases up to that date. Merklen and Wolf conclude that monocytic leukæmia is a justifiable term, review the literature, and record a case with 20,500 to 43,000 white blood-cells, which at autopsy showed diffuse proliferation of the reticular tissue of lymph glands, spleen, and marrow. In Hoff's case the total white count was 2500 to 1600, and the differential percentages were similar to those of the present Case 1. The example reported by Bingel in 1916 is admittedly doubtful. Swirtschewskaya records an instance where the leucocytes rose

from 6600 (59 per cent. monocytes) to 416,000 (96 per cent. monocytes) in the four and a half months preceding death; the post-mortem histology was comparable with the present cases except that the monocytes in the tissues were oxidase negative. The case of aleukæmic monocytosis, published by Rosenthal in 1921, has a blood picture similar to that now recorded. The only example reported in this country seems to be that described by Cooke in 1931 in a boy of 19; the leucocyte count was 49,800, of which 87 per cent. were monocytes; autopsy was not permitted.†

Naegeli disputes the existence of monocytic leukæmia, coming to the conclusion after a review of published cases that they consist in a monocytosis of the blood associated with myeloid hyperplasia in the tissues. Piney suggests that the evidence is all in favour of the conception of monocytic leukæmia belonging to the group of myelosis. The tissue changes in the present cases, however, did not resemble myeloid hyperplasia, except that some of the cells were oxidase positive; apart from the distinctive morphology of the individual cells their uniformity was much greater than is the rule in myeloid infiltrates; the relatively much greater involvement of the lymph glands than of the spleen is quite unlike myelogenous leukæmia; the presence in the type cells of ingested erythrocytes and hæmosiderin indicates affinity to the monocyte rather than the granulocyte.

It seems desirable to indicate briefly certain points of inter-resemblance between the two present cases. Clinically these include the insidious onset, pallor and weakness, notably the marked drowsiness throughout, enlargement on palpation of the liver but not of the spleen, and the blood changes. Necropsy showed marked involvement of the lymphatic glands and liver, definite hyperplasia of the marrow, and relatively moderate enlargement of the spleen. Both cases showed necrotic ulcers of some part of the alimentary canal. Histologically the tissues were infiltrated with monocytes, and free iron was found in the liver, spleen, bone-marrow, and lymph glands; the iron in the liver was greater in amount in the hepatic cells in the centres of the lobules than in those at the peripheries—an unusual distribution of siderosis. Finally, in both cases degenerative changes were present in the thyroid gland; no similar record has been found elsewhere. This association may be of ætiological importance or may be only coincidence—a point which will be elucidated by future experience.

My thanks are due to Prof. F. S. Langmead for permitting me to use the clinical records of these cases, and to Dr. C. W. Morley for the photomicrographs.

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† This statement now requires qualification, as since this paper was completed a paper has been published by R. Gittins and J. C. Hawksley (Reticulo-endotheliomatosis, Ovarian Endothelioma, and Monocytic Leukæmia, Jour. Path. and Bact., 1933, xxxvi., 115). These authors include an exhaustive survey of the literature.

PLEURAL EMPYEMA AS A COMPLICATION OF PYONEPHROSIS

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AMONG surgical conditions of the kidney commonly met with pyonephrosis represents a considerable proportion, the total number of admissions to the London Hospital during the last ten years being 180. Among these, however, the incidence of severe pulmonary complications has been surprisingly small.

It is well known that operations on the kidney are occasionally attended by post-operative effusion of fluid in the corresponding pleural sac. This especially follows difficult cases of nephrectomy for new growth in which the diaphragm is involved. Even this complication, however, is not so common as might be expected from the close anatomical relation which the kidney bears to the diaphragm. In cases of pyonephrosis the incidence of pulmonary complications appears to be even less, and a search through the records for the last ten years reveals only five deaths from pulmonary complication in this condition. Two of these cases revealed empyema pleuræ and two broncho-pneumonia, and one showed broncho-pneumonia with peritonitis.

The following are the notes of three cases which came under my notice:—

THE FIRST CASE

History.—Four weeks before admission the patient, a man aged 43, was taken ill with severe pain in the left loin. The pain settled down into what he described as a worrying ache. He became more restless, and could not lie in one position for more than a few seconds at a time. That evening he became worse and vomited three times. There was no trouble with micturition and the bowels were opened that day. The temperature rose to 103° F., and he complained of feeling very dry and parched. The next morning he vomited again. The pain was still present, though not so severe, and the temperature was down to 100°. That night the temperature was again 103° and this diurnal variation persisted for seven days. On the fourth day the pain ceased, and an examination of the urine at this stage showed nothing abnormal. He remained in bed for 11 days, when he was allowed up, but the pain immediately returned with a sudden rise of temperature to 104°, accompanied by shivering. He returned to bed, and at this time began to notice a swelling in the left side and a feeling of tightness and distension of the upper abdomen. The urine was not examined. At night he now began to sweat profusely, was very thirsty, and had lost all appetite. Taking food increased the pain but he did not vomit again. He felt very weak and began to waste.

During the third and fourth weeks the symptoms were increased, and added to them was difficulty in breathing, with marked pain in the left chest. Coughing was especially painful. The bowels were open regularly without aperients during the whole course. The urine was not tested again after the first week.

On admission the patient looked very ill. His temperature was 102·6°, his pulse-rate 112, and his respiration-rate 32. The face was sunken and pale, with a hectic flush on the cheekbones. The tongue was dry, with a dirty brown fur. He was sweating profusely. On inspection there was marked bulging in the left loin. No respiratory movement of the abdomen was seen on the left side. On palpation the swelling was very tender and did not move on respiration. The fingers could only with difficulty be depressed between the left costal margin and the swelling. On bimanual palpation of the loin the swelling could be pushed up from behind and a distinct cystic feeling was elicited. On percussion a band of resonance was found in front of the swelling, but posteriorly the dullness was continuous from the erector spinæ outwards and to the front until the band of resonance was met.

There was a distinct bulge of the lower intercostal spaces in the mid-axillary line. Tactile vocal fremitus was lost, and the left chest was stony dull up to the sixth rib in the mid-axillary line. Breath sounds were absent over the lower part of the chest, but in the upper part many moist

sounds were heard. The heart sounds were normal in all areas, but the position of the apex-beat could not be determined.

The urine was dark red with a large amount of deposit; a quarter-volume of albumin was present, and the guaiac test was positive to blood. Naked-eye inspection of the deposit showed pus.

A diagnosis of left pyonephrosis with associated pleural effusion was made and, in view of the serious condition of the patient, drainage of the kidney was determined upon as an immediate measure.

At operation the patient was given a general anæsthetic (A.C.E. and open ether). To confirm the diagnosis a cystoscope was passed. The bladder was very injected and œdematous, especially in the neighbourhood of the left ureteric orifice and trigone. Clear urine was seen issuing from the right orifice, which was contracting rhythmically and at normal frequency. The left ureteric orifice showed the contractions to be less frequent and of longer duration, and from time to time a bead of yellow pus was extruded. The patient was then placed in the right lateral position and the kidney approached by Morris's incision. The parietal tissues were very œdematous. The perirenal fat was almost entirely absent, and the kidney greatly enlarged and pale pink. There was no perinephric suppuration. A trocar and cannula were inserted into the kidney, and 22 ounces of foul-smelling, blood-stained pus was evacuated. On inserting a finger into the pelvis of the kidney several pieces of calculus debris were felt. Removal of the cannula was followed by an immediate brisk hæmorrhage. All attempts to control the bleeding by mattress sutures through the kidney substance were of no avail. Immediate nephrectomy was decided upon, as the hæmorrhage was becoming increasingly severe and the pulse-rate had risen to 140.

The kidney was very adherent to the diaphragm, and during the operation of stripping it there was a sudden gush of pus from above, and a further 15 to 20 ounces drained out through a small rent in the diaphragm. The removal of the kidney was then completed. Drainage of the kidney-pouch was arranged and, as the condition of the patient was now very poor, all thought of rib resection for drainage of the thorax was dismissed as impracticable. A second drainage-tube was consequently passed up through the rent in the diaphragm and sutured in position with its outlet through the wound in the loin. The wound was then closed.

At this time the patient was scarcely alive, respirations being very shallow and rapid, and the pulse imperceptible. Infusion of one pint of intravenous saline was without effect, so it was decided to send out an emergency call for a blood donor. A Group 4 donor was available after two hours, and 800 c.cm. of whole blood with 200 c.cm. of 2 per cent. citrate solution were given into the median basilic vein. The result was immediate, and the patient improved rapidly.

Progress.—Drainage was free for several days, especially from the thoracic tube. The temperature was normal on the second day and the pulse-rate had settled to about 90. Breathing was painless, and by the end of three days the respiration-rate was 18. The tube draining the kidney bed was removed after the third day, but the tube in the thorax continued to drain until the tenth day, when it was removed. Culture of the pus from the kidney showed *Staphylococcus aureus* with *B. proteus*, and that from the pleural cavity grew the same types of organism.

The patient was discharged well on the 27th day. Pathological examination of the kidney showed marked expansion of the pelvis with severe inflammatory changes. There was much phosphatic debris, and several small abscesses were present in the cortical substance of the kidney which had escaped destruction.

THE SECOND CASE

History.—The patient was a woman, aged 34, admitted on Jan. 31st, 1931. For 13 years she had been complaining of pain in the back but no other symptoms. Two years before the pain had begun to get much worse, radiating to the left groin, with occasional attacks of hæmaturia. In the last eight months she had been suffering from severe attacks of giddiness, thirst, and headache. The last menstrual period had occurred six months before admission.

On admission her temperature was normal, her pulse-rate 96, and her respiration-rate 17. She had a mitral facies and cyanosis. The uterus was one inch below the umbilicus, and fœtal parts could be felt. There was a large tumour in the left flank. The heart showed mitral stenosis. The lungs were clear. There was considerable œdema of the feet, and the urine showed pus and one-seventh volume of albumin. The blood-urea was 0·021 per cent. After three weeks in bed the patient was much better and was discharged. A radiogram taken at the time revealed calculi in the left kidney.

On April 10th she was *readmitted* for labour. There was a large swelling in the left flank. Her temperature was 99° and her pulse-rate 80. She had a precipitate labour lasting 20 minutes. The child was premature, weighed 3 lb. 7 oz., was alive, and did well. She was transferred from the obstetric ward to a medical ward on the tenth day. She still had a tumour in the left flank. The temperature was swinging, and her pulse-rate was 100. The chest revealed bronchial breathing over the left lower lobe, and the left base of the lung was dull to percussion. The swelling in the loin, after ten days, began to increase in size, and the skin became reddened over it.

She was then transferred on May 8th to surgical care. An operation was deemed advisable, and on the 9th exploration of the kidney was carried out. A large pyonephrosis was drained, and several calculi withdrawn from the kidney pelvis. The temperature continued to swing and the patient did not respond as well as would be hoped, so on May 31st a further exploration was carried out, when a fresh loculus of pus was released. The temperature continued to swing, and on June 21st the patient died. At *post-mortem examination* the kidney area was more or less clear, whereas the left chest showed a large empyema.

A THIRD CASE

The third example occurred many years ago and was a case of left-sided pyonephrosis which was untreated for 14 days. Perinephric abscess was then diagnosed, and an incision made which drained off much pus from around the kidney. After a week, however, the condition was further diagnosed as pyonephrosis, and a further operation performed for drainage of the kidney itself. The patient was very ill by this time and the possibility of serious pulmonary complication was apparently overlooked. The patient died, and at autopsy a large empyema pleuræ was revealed.

DISCUSSION

In viewing these cases from their pathological aspect, an attempt has been made to comprehend why in these instances the kidney condition should have been complicated by empyema; why the complication is usually rare; and also what bearing these cases have upon other infective processes close to the inferior surface of the diaphragm.

Among the commonest of these latter cases is the condition of subphrenic abscess. During the five years ending 1930, 43 cases of subphrenic abscess were treated in the London Hospital. Of these 67·44 per cent. were complicated by pleural effusion, and in 27·9 per cent. the effusion was purulent. In many of the cases there was direct communication between the subphrenic and pleural collections of pus.

A consideration of the pathology and clinical course of these cases gives the clue to the answer of the first two questions. In both subphrenic abscess and pyonephrosis there is an active infective process close to the inferior surface of the diaphragm. Lymphatic communication through the diaphragm is rich, and consequently the infection can be transmitted easily to the upper surface. This will call forth a corresponding inflammatory reaction in the parietal pleuræ covering the diaphragm and, if the condition beneath the diaphragm be unrelieved, effusion of fluid into the pleural cavity will result. The effect of the inflammatory process above the diaphragm will, however, be heightened if there is any factor which will tend to limit the movements of this muscle, and in subphrenic abscess this factor is present—namely, peritonitis. With an abscess in the upper part of the peritoneal cavity abdominal respiration is decreased or non-existent, and hence we already have one explanation why pleural effusion and its later manifestation, empyema, should be more prevalent in cases of subphrenic abscess than in pyonephrosis. Where there is direct communication between the subphrenic abscess and the pleural cavity the empyema is nearly always preceded by a simple pleural effusion before the more serious and usually fatal complication supervenes.

Though coexisting peritonitis may to some extent explain the variation in the course of the two conditions we are considering, there is, in my opinion, a far more important factor—the time element. I refer to the time which elapses between the onset of the infective process and the diagnosis of its presence. In my experience subphrenic abscess is most frequently met with as a complication of perforated gastric or duodenal ulcer. The operation appears to have been successful and the patient to be on the road to recovery when the temperature begins to swing. As chest complications of a mild nature are common after upper abdominal operations, particularly those of the emergency type, often little importance is attached to this variation in temperature until a day or two has elapsed, in some cases even longer. Examination of the chest then usually shows pleural effusion. Even then the surgeon is often hesitant to diagnose subphrenic abscess, and thus a long period elapses during which the inflammatory process is free to exert its action upon the diaphragm. Added to the hesitancy on the part of the surgeon to diagnose what he fears, but hopes is not present, is the difficulty of being clinically certain that subphrenic abscess is present, and the condition may be missed, in spite of the most careful efforts to detect its presence.

With pyonephrosis, however, the diagnosis is usually swift and certain. There is usually a history of pain in the renal angle and in some cases renal colic. There is in nearly all cases a palpable cystic tumour, pus and blood are commonly present in the urine, and on cystoscopy pus can be seen exuding from the corresponding ureteric orifice.

The explanation of why the particular cases quoted above were complicated by empyema is, in my opinion, to be credited to the time element as represented by the period between the onset and the late diagnosis. In all three cases a more than usually long history of illness is present, and it is to be expected that had operative interference been carried out earlier the empyema would not have developed.

There remains one other reason why pyonephrosis should unusually produce empyema as a complication. This is anatomical. The kidney is surrounded by a tough fibrous capsule which limits the spread of the infection, and this is probably a potent factor in preventing pulmonary complications.

SUMMARY

(1) Cases of pyonephrosis very unusually give rise to severe pulmonary complications, only 5 cases out of a series of 180 being so complicated.

(2) Other cases of subphrenic acute infective processes, notably subphrenic abscess, very often give rise to severe pulmonary complications, 67·44 per cent. being accompanied by effusion of some kind, and 27·9 per cent. by purulent effusion.

(3) The explanation of this apparent inconsistency is probably threefold: (*a*) The long period usually elapsing between the formation of a subphrenic abscess and its detection, as contrasted with the usual early diagnosis of pyonephrosis. (*b*) The upper abdominal peritonitis associated with subphrenic abscess and the resulting immobility of the diaphragm. (*c*) The tough fibrous capsule of the kidney exerting a limiting effect on the spread of infection.

(4) Cases of acute pyonephrosis left untreated for long periods are likely to develop severe intrathoracic complications.

In conclusion, my thanks are due to Mr. Russell Howard, Mr. Hugh Lett, and Prof. Arthur Ellis for permission to publish the details of these cases.

THE CLINICAL SIGNIFICANCE OF THE NERVE-ENDINGS IN THE MESENTERY

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The sensitivity of the mesentery to ordinary mechanical stimuli and its possible rôle in the causation of abdominal pain has recently been brought to the fore largely through the writings of Tyrrell-Gray. He describes (1922) the mesentery as exceedingly sensitive to every kind of stimulus, mechanical, chemical, and thermal, and advances the view that true visceral pain primarily arises from the mesentery, partly by impulses arising in the Pacinian corpuscles. Breslauer has suggested that the impulses which initiate visceral pain do not arise in the intestine but in the mesentery, and in particular in the mesenteric blood-vessels. He observed that areas of the peritoneum which contain large blood-vessels are more sensitive than areas in which no large vessels are present. The sensitivity of the mesentery to ordinary mechanical stimuli has apparently been doubted by many investigators, but the recent work of Morley has finally established this fact. As a result of his observations under local anæsthesia Morley concludes that the mesentery is decidedly sensitive from its root to a point a little distance away from its attachment to the bowel. In another paper (Sheehan) an account is given of the exact distribution and proportion of the Pacinian corpuscles and of other afferent nerve-endings in the mesentery. The clinical significance of the free myelinated nerve-endings and of the fine non-myelinated plexus has already been discussed. In view, however, of the possible significance of the Pacinian corpuscles in the mesentery in regard to the causation of abdominal pain, a short discussion on the views advanced as to the function of these bodies appears important.

FUNCTIONS ATTRIBUTED TO THE PACINIAN CORPUSCLES

First noticed by Vater, professor of anatomy at Wittenburg in 1741, and later fully described by Pacini, an Italian physiologist in Pisa, in 1830, these encapsulated nerve-endings have been the subject of much controversy. After assessing all the known facts concerning them, we find very little firm basis on which to build any true conception of their function. We can perhaps summarise the theories that have been advanced, and the views held as regards them, as follows:—

1. *Touch*—i.e., end-organs for the reception of the sensation of touch. This view was put forward in the early days of the knowledge on sensation, when the discovery by Blix in 1885 of the punctate distribution of sensibility of the skin first led to the belief in the existence of specific end-organs, each subserving a special form of sensibility.

Though the belief in specific end-organs is still supported by many authorities, the view of looking upon the Pacinian corpuscles as special receptors for the sensation of touch is now no longer held. Waterston has made sections and examined microscopically such spots as were known to be sensitive to touch stimuli, and failed to demonstrate the presence of these corpuscles. Furthermore the presence of these bodies lying deeply in the subcutaneous tissues, around the periosteum of bones, and in the mesentery of the cat, where touch stimulation can be obviously excluded, shows conclusively that they cannot be looked upon as agents subserving this function.

2. *Pain.*—The evidence that the Pacinian corpuscles may possibly act as receptors for pain is largely clinical and is supported chiefly by the writings of Tyrrell-Gray. He (1922) attributes the greatest importance to these bodies in the mechanism of abdominal pain, and even suggests that intestinal colic is caused by pressure upon them in the mesentery. He argues (1926) that in acute appendicitis inflammation first involves the mesentery of the ileocæcal angle, thus causing irritation of the Pacinian corpuscles from which proceed (*a*) pain impulses and (*b*) afferent impulses resulting in rigidity of the abdominal muscles. Kinsella in his article on abdominal pain also suggests that the Pacinian bodies may in some way be associated with pain—"The parietal peritoneum is very sensitive and pain is produced by dragging on it. The presence in the parietal peritoneum of the sensory corpuscles of Pacini are of significance." Head in 1893–94, drawing an analogy from his divisions of sensation of the skin, attributed to the viscera a protopathic sensibility only, and assumed that the Pacinian bodies are the means by which we gain a power of appreciating intestinal movement similar to that of joint and muscle sense.

From observations made in a previous communication it seems that the corpuscles are present in far too small a number in the human mesentery to account for the acute pain associated with appendicitis and intestinal colic. The theory cannot be excluded from a review of the distribution of the corpuscles in the body, as in all situations where they occur, pain can become an important feature. But the view is purely theoretical and is based on no practical evidence of any kind. Further, from the work of von Frey the balance of evidence is now in favour of accepting the free nerve-endings as the specific organs for pain.

3. *Thermal Sense.*—Luciani supposes the Pacinian corpuscles function partly as end-organs for the sensation of heat. He does not elaborate this view, and there does not appear to be very much in support of it. Adrian and Ulmrath (1929) in their researches showed that changes in temperature do not excite any discharge of impulses from the corpuscle along the nerve.

4. *Deep Pressure and Muscle and Joint Sense.*—Although essentially different, these two functions may be considered here together, as the supporters in most cases uphold this double function for the Pacinian corpuscle. The view was based on the knowledge of the structure and of the distribution of these corpuscles in the body. Those lying deeply in the subcutaneous tissues are from their position admirably suited to respond to deep pressure stimuli, whilst the corpuscles so constantly found in the neighbourhood of joints, particularly on the flexor aspects, were considered to respond to the movements of the muscles and joints. Furthermore the histological appearance of the corpuscle was advanced in support of this view. The multi-lamellated capsule was looked upon as a protection for the fine nerve-ending against all lighter stimuli as from touch and small degrees of heat and cold. The theory received support from many authorities, and is the prevalent view at the present day in regard to the function of these bodies. Herrick states it clearly as follows: "By these end-organs relatively coarse pressure may be discriminated and localised (exteroceptive function) and movements of muscles and joints can be recognised (proprioceptive function)." Sherrington (1900) and Bayliss (1915) both gave this explanation.

In support of this theory is the work of Adrian and Ulmrath cited above.

They devised an experiment for recording the impulse discharge on stimulating an isolated group of Pacinian corpuscles, lying beneath the tendons in the hind foot of the cat. An immediate discharge of impulses was recorded when joint movement or pressure stimuli were applied, but varying temperatures, as previously stated, caused no impulse discharge. Pressure on a single isolated Pacinian corpuscle with a glass rod drawn out to a small rounded point gave a similar record of impulse discharge along the nerve. Furthermore, if the corpuscles are destroyed, movement of the toe and pressure over the same area gave rise to no discharge of impulses.

This work confirmed in a striking manner the theory of the corpuscles subserving the sensations of deep pressure and joint and muscle sense. But Adrian and Ulmrath point out that sensations of joint movement are probably derived from more than one type of end-organ, for in the frog, which has no Pacinian corpuscles, impulse discharge along the sciatic nerve is recorded on movement of the knee-joint, after all nerve branches to the muscles are cut. "In mammals the corpuscles which are in close relation to the joints will evidently signal the changes of pressure produced by the joint movement, though other forms of ending may take some part in the message."

It is interesting in view of these findings to look back to the work of Ramström. He showed (1908 *a*) that Pacinian corpuscles occurred in the parietal peritoneum, and he further demonstrated (1908 *b*) in a series of operations under local anæsthesia that the parietal peritoneum is insensitive to pressure and thermal stimuli. This observation was confirmed by Capps and Coleman in 1922. Ramström naturally concluded that Pacinian corpuscles were in no way related to the function of pressure recognition, a view which, he states, is quite untenable with his clinical findings.

5. Ceelen in 1912 gave a review of a hundred human post-mortems with special reference to the presence of Pacinian corpuscles in the abdomen. He suggested some possible trophic function associated with the growth of the body, the corpuscles possibly disappearing later in life like the thymus. This he based on the rather insufficient evidence that in 11 per cent. of the cases he was unable to find any Pacinian corpuscles, but in every infant and 95 per cent. of the children examined they were present. It surely seems more feasible to suppose that the corpuscles are more easily found and identified in the infants and young children, where the view is not so obscured by the large accumulations of fat, commonly discovered in the mesentery and omentum of elderly subjects. He also observed that where the corpuscles occurred in very large numbers the lymphatic apparatus appeared swollen, and in some cases he found the Pacinian corpuscles themselves œdematous, a watery fluid lying between the lamellæ.

6. *Regulators of Circulation and Blood Pressure.*—This will be discussed fully below.

DISTRIBUTION AND STRUCTURE OF THE PACINIAN BODIES

This formidable list of conflicting views and theories serves to show how little is really known regarding the function of these corpuscles. One or two general and more essential aspects of the problem seem important. In the first place, where are Pacinian corpuscles to be found elsewhere in the body? We can tabulate the distribution in the body as follows:—

1. Deep layers of the skin, especially fingers and toes.
2. Tendons and sheaths of muscles.
3. Near joints, especially flexor aspects.

4. Periosteum and interosseus membranes.
5. Serous membranes—e.g., pleura, pericardium, synovial membrane, mesentery and mesocolon, parietal peritoneum, and in peritoneum over bladder.
6. Genital organs—glans penis.
7. In the capsule and interstitial tissue of certain organs, notably, pancreas, lymphatic glands, ovary and prostate, thyroid and parathyroid.

In an investigation involving the examination of the pancreas in man Ceelen found the Pacinian corpuscles in 89 per cent. of cases. They varied widely in number and distribution, and were most numerous on the posterior aspect of the head. Ceelen described them directly in relation to the parenchymatous tissue.

They do not exist only in mammalia; they are also to be found in reptiles and in birds in the beak and tongue (corpuscles of Herbst); but they are present in much greater frequency in mammalia. The prevailing opinion seems to be that they are *not* present in amphibia. Now it is clear that any function or functions which we may assign to the Pacinian corpuscle must necessarily be in accordance with this wide distribution in the body.

A second point to be emphasised is that all the well-known forms of corpuscular end-organs are built upon a uniform plan, consisting of an outer lamellated connective tissue capsule with a core of softer material through which the nerve-axon runs to its final arborescence. Between the largest Pacinian corpuscles that are plainly visible to the naked eye, and those of Golgi-Mazzoni, which can only be detected with the microscope, there is an uninterrupted series of intermediate or transitional forms. And from the so-called genital corpuscles there is a further gradual transition to the more elaborate corpuscles as described by Golgi and Mazzoni. Thus we have to remember in ascribing any particular function to one type of end-organ that there are all grades of corpuscles between the typical Pacinian and the other similar lamellated corpuscles. This point was very clearly demonstrated in the previous work, where the corpuscular end-organs in the mesentery varied so markedly in size and in thickness of lamellation.

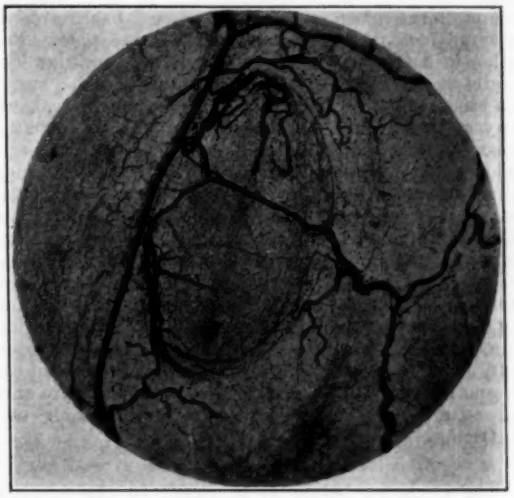
And lastly, previous work has demonstrated that the nerve-endings in the Pacinian corpuscles, at least in the mesentery of the cat, are splanchnic in origin—i.e., are presumably part of the sympathetic system. It is of course questionable whether this can be extended to all the Pacinian corpuscles in the body, but the fact that groups of these corpuscles have been dissected along the finer branches of the radial and median nerves is no argument against the view, as the sympathetic fibres are known to supply practically every tissue in the body, and to reach them via the main somatic nerve-trunks. Woollard, however, finds that the nerve-endings in Pacinian bodies lying close to blood-vessels do not degenerate following sympathetic denervation of the lower extremity.

It is of interest in regard to this question that in the lower limbs of two patients upon whom bilateral lumbar sympathectomy had been performed some months previously, it was found impossible to stain the nerve-axon in the corpuscles in the ball of the foot, although the nerve-fibres in the proximity stained clearly with silver. Although more light is required on this question of sympathetic afferents, it seems apparent, from the present state of our knowledge, that any function of the Pacinian bodies, at any rate in the mesentery, must inevitably be intimately associated with the sympathetic system.

With these aspects of the problem before us can we form any truer conception of the function of these bodies?

THE VASCULAR SUPPLY OF THE PACINIAN CORPUSCLE

It has been known for a long while (Herbst, 1848) that the Vater-Pacinian corpuscle possessed a particular blood-supply, not only in relation to its outer surface but also by the possession of a capillary network which penetrated the base of the corpuscle along with the main nerve-fibre. Schumaker (1907 and 1911) and Michailow (1909) both investigated this aspect of the problem, and though differing in



Section of a Pacinian corpuscle showing the vascular supply.

their findings as regards a capillary network existing in the central core of the corpuscle, they both concluded that the corpuscles responded to changes in blood pressure owing either to an increased amount of fluid in or around them. Schumaker found that the shape of the corpuscles became altered on raising the pressure in the mesenteric vascular system. On the surface of the lamellated bodies Michailow was able to demonstrate a fine elastic network. Previously, Thoma in 1884 had expressed the view that Vater-Pacinian corpuscles, which he found in the outer zone of the adventitia of the aorta, may act as regulators of vascular tonus.

The view that the Pacinian bodies were in some way associated with the reflex contraction and dilatation of the blood-vessels was expressed by Raines (1909), Van de Velde (1908), and by Collin (1921). Lawrentjew and Dowgjallo make similar suggestions, and Dowgjallo adds that their function appears to be to perform a coördinating apparatus between the lymphatic and blood vascular systems.

Thus it became essential in any study of Pacinian corpuscles from the functional aspect to make a confirmatory investigation of the blood-supply to these bodies. This was done by the injection of carmine gelatin injection mass into the superior mesenteric artery, after previously washing out the mesenteric circulation with warm saline solution. The mesentery was then removed and placed into 10 per cent. formol saline, and left in the ice-chest overnight, to allow the injection mass to set. Isolated corpuscles were then selected, dehydrated, and cleared in xylol and mounted. Several cats were injected in

this manner, and the corpuscles in the mesentery examined.

A very striking feature became evident immediately, that the Pacinian corpuscle possessed two sources of blood-supply. The first consisted in a vascular plexus surrounding the external aspect of the capsule. This was present in every case, and in the majority a series of vascular loops or bands could be discerned encircling the body of the corpuscle transversely to its long axis (see Figure). In addition, each Pacinian body received a central vessel. This ran into the corpuscle with the main afferent nerve, often as far as the central core, but contrary to most descriptions it always appeared to form vascular loops (more often single) and twist backwards to emerge from the corpuscle at the same pole. Frequently a second, but usually smaller, vascular loop could be seen penetrating the opposite pole, but in no case, no matter how thin the injection mass, could any connexion be established through the corpuscle between the two vascular loops. This was the case when the injection had distended even the finest capillaries visible under the microscope. Not every corpuscle possessed a vascular loop at each pole. These two sources of blood-supply, the capsular and central, occasionally arose together off the same vessel, but more frequently issued from quite different arterial branches. From these findings it became evident that there must be some definite association, some interrelation between the blood vascular system and these sensory nerve-endings, for it cannot be supposed that these small bodies would require such an extensive blood-supply purely for their own nutrition.

THEIR FUNCTION

The evidence before us in regard to the function of the Vater-Pacinian corpuscles can therefore be briefly summarised as follows :—

1. The histological structure of these encapsulated nerve-endings and their intimate relationship, at least in the mesentery, with the sympathetic nervous system.
2. The wide distribution of these corpuscles throughout the body.
3. Their complex vascular supply, apparently far in excess of their own nutritional requirements.
4. The results of the critical experiments of Adrian and Ulmrath, an immediate discharge of impulses being recorded when joint movement or pressure stimuli were applied directly to an isolated group of Pacinian corpuscles.

It is difficult from our present knowledge to come to any final conclusion as to the function of these bodies. The theory that the impulses originating in Pacinian corpuscles may cause reflex contraction and dilatation of blood-vessels still leaves unanswered the question of the nature of the adequate stimulus required to give rise to an impulse in the Pacinian body. The explanation is probably to be found in the results of Adrian and Ulmrath's work, pressure at once suggesting itself as the most probable factor. By some such interpretation is it possible to correlate the two prevailing views as to the function of these end-organs ?

But such an explanation does not quite answer all the aspects of the problem. Pressure cannot account for the stimulation of corpuscles buried deeply in the tissues and lying in the posterior abdominal wall. Tension on the root of the mesentery is the most obvious cause here, stimulation of the afferent fibres of the splanchnic nerves being caused presumably through the nerve-endings in the Pacinian bodies. Extending this view to the corpuscles situated elsewhere in the body, it is interesting to note that they have been found, in addition to the root of the mesentery, on the peritoneum covering the bladder, on the pudic nerves in the penis and clitoris, on the nerve-fibres around the nipple, in tendons and ligaments, and in relation to joints, all situations where pulling or stretching (both resulting in tension) play an important part. It is difficult to dissociate the two methods of stimulation, pressure and traction, and von Frey and Kriessow (quoted by Greenwood) have found that the sensation experienced in pulling and pushing appeared to be identical, provided the magnitude of the pull in one case was equal to that of the push in the other ; that is to say, the end-organ is excited by a change in the existing pressure relations whether the change be positive or negative, increase or decrease.

Secondly, it is a possibility that the change in blood pressure may in some cases be the *cause* and not the result of impulses arising in Pacinian bodies. Sherrington, in 1900, showed that a condition of the blood or lymph could be easily conceived to not only affect the nerve-centres centrally, but also by peripheral changes to excite sensory nerve-endings. A deficiency of lymph might certainly induce a relaxation of the structures to which afferent nerve-fibres are related—e.g., capsules of Pacini. This interpretation would give us some explanation for the "sinking feeling" and vague sensation, bordering on pain, and obviously sympathetic in origin, which accompany all conditions of shock, a period of profound capillary dilatation. It would also explain the conscious awareness that we experience during over-activity of any gland. Luciani points this out clearly. He says :

> "Normally we have no clear and distinct consciousness of the functions of the internal organs and tissues, but we have a dull and obscure knowledge—i.e., an incessant awareness of our body termed 'the fundamental sense of existence.' In the state of perfect health this remains below the threshold of consciousness, and is prevented from becoming a distinct sensation with specific localisation. But when it reaches a certain intensity it is perceived as a vague sense of general well-being or the reverse. These are transmitted by the afferent nerves of the sympathetic system."

Finally, what is the meaning of the complex-lamellated capsule ? The finding of a nerve-fibre running straight through a corpuscle without termination, seems to give us a possible explanation. The lamellæ of the capsule can be seen in any section to be continuous with the neurilemmal sheath of the issuing nerve ; the entire capsule can thus be looked upon as an enlargement of the neurilemma to act no doubt as a "shock absorber." In most cases this is arranged around the delicate nerve-ending, but in certain cases, in order possibly to ensure against slight stimuli, causing profound changes in arterial pressure and blood volume, a double "shock absorber" is included in the circuit, and the nerve-fibre can be seen traversing two adjacent corpuscles before terminating.

It is impossible at this stage to come to any more definite opinion as to the function of the Vater-Pacinian corpuscles. It appears from a study of the structure and distribution of these bodies that their function is in some reflex manner related to the contraction and dilatation of blood-vessels, and that the adequate stimulus for the nerve-ending is pressure or traction. It is hoped that further light will be thrown on the problem in the near future.

My sincere thanks are due to Prof. J. S. B. Stopford, under whose direction this work has been done ; and to Prof. E. D. Telford and Prof. Stopford for permission to use the amputated limbs mentioned above.

(*Continued at foot of opposite page*)

THE HEART AFTER DIPHTHERIA

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Franklin White and H. H. Smith [1] examined nearly 1000 patients recently discharged from hospital convalescent after diphtheria. They found that 75 per cent. still showed evidence of myocardial defects and relative insufficiency of the mitral valve, while about one-third of the cases (not including babies) suffered from tachycardia and irregularity of the pulse. They pointed out that such cardiac abnormalities were not commonly found after scarlet fever, measles, typhoid, or pneumonia.

Some 78 cases of convalescent diphtheria were described; all of them had signs of heart damage when they left the isolation hospital, 29 of them having been "very severe" cases and the remainder "moderate" or "mild" cases. Care was taken to exclude from the series any patient who gave a history of other ætiological factors such as rheumatism. Most of the cases were found to have murmurs and some degree of cardiac enlargement. Five had a persistently rapid heart-rate, and in four cases there was enlargement of the heart out of proportion to the other signs. After repeated observation over a period of from 2 to 12 months they were able to state that the majority of these cases showed a steady improvement in the condition of the heart. About a quarter of the cases, however, were still abnormal at the end of four months from the onset of the disease, but 6 of these had recovered when re-examined a few months later. Of the remaining 13, 5 were kept under observation for five months, 4 for six months, and 2 for eight months before recovery was complete.

The persistence of signs as late as 11 months after diphtheria led them to believe that in some cases the defects might be permanent.

Hoskin [2] has described a smaller series of cases convalescent after diphtheria in which electrocardiographic records were also obtained. The abnormalities noted were: (*a*) increased heart-rate; (*b*) symptoms of cardiac insufficiency in half the cases and diminished cardiac reserve; (*c*) presence of heart abnormalities in almost every case on physical examination; and (*d*) changes in the electrocardiogram, notably "slurring" of the Q R S complex.

Although there is general agreement that cardiac abnormalities may persist up to about a year after diphtheria, opinions vary as to the possibility of later after-effects from this disease. Duckett Jones and P. D. White [3] examined 100 patients who had suffered from diphtheria five to eight years previously, and their results are summarised in their own words as follows: "No evidence of organic heart disease was found by history, physical examination, routine electrocardiogram or X ray (when needed). There were a number of patients showing functional systolic murmurs, sinus arrhythmia, third heart sounds, and two exhibiting premature beats." Furthermore, the authors cast some doubt upon the positive findings of previous workers on the grounds that their criteria of abnormality were probably unsound. Again, Sutherland [4] states definitely that after excluding rheumatism and other common ætiological factors there is nothing to support the suggestion that diphtheria has a lasting effect upon the heart. On the other hand, many experienced observers consider that diphtheria may be the ætiological factor responsible for heart disease appearing in later years. Rolleston [5] states that "In view of the liability of the toxins of diphtheria to affect the myocardium it is probable that diphtheria may be responsible for many cases of permanent cardiac weakness in patients who recover. The writer (Rolleston) has often met with examples of cardiac insufficiency in adults who dated their symptoms from an attack of diphtheria many years ago." Recently, Butler and Levine [6] published some interesting observations on the ætiology of heart-block, showing that in a group of 20 cases of heart-block more than half gave a history of diphtheria previously—i.e., and incidence three times as great as in a large group of control cases.

While the frequency of post-diphtheritic heart complications is a matter of controversy, there can be no doubt that proved cases do occur occasionally. Parkinson [7] described the "first undoubted case" of auricular fibrillation supervening upon heart-block due to diphtheria. A case of permanent bradycardia has been recorded by W. D. Reid.[8] Auricular flutter as a complication five weeks after diphtheria has been reported by O'Donovan.[9] Jones and White [3] mention a case of high-grade heart-block which developed on the third day of diphtheria and became permanent, and it was this case that prompted these workers to undertake the investigations to which reference has been made above. The cases which are described in what follows were examined for much the same reason—namely, the appearance of two patients who had sustained permanent damage to their hearts owing to diphtheria; these cases have been described elsewhere.[10]

THE PRESENT INQUIRY

Nearly two hundred patients were interviewed and a history obtained from each one with particular reference to the following facts: (1) Age. (2) Date when diphtheria was contracted. (3) Previous illnesses (especially for such common ætiological factors as rheumatism and chorea). (4) Any cardiac symptoms or change in general health since diphtheria. A routine examination of the heart, arteries, and pulse was then made, and an electrocardiogram was obtained, using a Cambridge Instrument Company electrocardiograph fitted with immersion electrodes. Sphygmomanometer readings were not taken, as the psychical disturbance usually present on making a

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single examination in a child was considered sufficient to render such readings valueless.

A considerable number of cases were excluded because of (1) a history of recent febrile illness—e.g., common cold or tonsillitis, (2) rheumatism or chorea, or (3) doubtful evidence of diphtheria on reference to the notes of the patient when in the isolation hospital. Thus the number of cases was reduced to about 150. These "patients" had had diphtheria from one to ten years before the time of re-examination, and though the majority of them were children and young people, a few adults were also included.

The following electrocardiographic information was obtained in each case to supplement the clinical data mentioned above: (1) P–R interval. (2) Q R S interval. (3) R–T interval. (4) Ventricular preponderance. (5) Splitting of the R wave in leads I. or II. (6) Progressive flattening of the T wave from lead I. to lead III. (7) Negative or iso-electric T wave in lead III. (8) Abnormality of the P wave in any lead. (9) Bizarre Q R S in lead III. (10) Large T waves in leads I. or II.

OBSERVATIONS ON THE DATA

1. As already stated above, the great majority of the patients were children, the average age being 14 years.

2. Rheumatism and chorea were the only ætiological factors taken into consideration. Ten of the patients gave some kind of history of these diseases, but only four were considered to be definite enough to be excluded on these grounds.

3. A history of cardiac abnormalities during the acute stage of diphtheria was remarkably rare, but allowance must be made for the fact that only the patients who survived the disease were examined, and many cases in which there had been a greater possibility of permanent cardiac damage find no place in the series. There were 21 cases (14 per cent.) which had a history of clinical abnormalities in the heart during diphtheria. On analysis it was found that only two of these had any symptoms or signs of a cardiac lesion on re-examination. Three of the cases showed splitting of the R wave in leads other than lead III., and two were characterised by irregularity of the P wave. All the measurements were within normal limits, and the P–R interval was always well under 0·2 sec. Vagaries of the T wave and the Q R S complex in lead III. were frequent, and further reference will be made to this below.

4. The following patients, eight in number, presented signs or symptoms suggestive of cardiac abnormality:—

No. 9.—Heart not enlarged. Heart sounds normal except for duplication of the second pulmonary sound. Mitral systolic bruit conducted towards the axilla; basal systolic bruit not conducted.

No. 29.—Heart not enlarged. Sounds normal; aortic second sound duplicated. Soft, blowing, mitral systolic bruit conducted towards the axilla.

No. 31.—Doubtful case; no abnormality except a localised aortic systolic bruit.

No. 35.—Heart normal in size. Heart sounds normal. Mitral systolic bruit conducted appreciably towards the axilla.

No. 62.—Size of heart and character of the sounds normal. Mitral systolic bruit conducted about 2 inches towards the axilla; basal systolic bruit not conducted to the neck.

No. 71.—Heart sounds and size of heart normal. Mitral systolic bruit conducted about 3 inches towards the axilla.

No. 90.—Heart rather large for a boy of 12 years, but possibly within normal limits. Excessive cardiac thrust and faint systolic thrill palpable. First mitral sound accentuated; a mitral systolic bruit present, but not conducted appreciably towards the axilla.

No. 141.—No abnormality, but extrasystoles and a mitral systolic murmur not conducted to the axilla.

Omitting Cases 31 and 141, where the cardiac abnormality was of doubtful importance, it was found on referring to the detailed analysis that in none of these cases was there a history of rheumatism or other ætiological factors, and in only one case (No. 62) was any cardiac abnormality mentioned during diphtheria. The evidence points, then, to a greater or lesser degree of mitral incompetence in five cases—i.e., 3·3 per cent. of the series. The electrocardiograms were for the most part normal, except that Cases 9 and 141 showed a split R wave in significant leads. If mitral incompetence was present in this group of five cases it was evidently fully compensated in each case, for no history of cardiac insufficiency was obtained in any of them, and with the exception of one case there was no appreciable enlargement of the heart.

5. The P–R interval was remarkably constant. A detailed analysis showed that the vast majority of the cases had a P–R interval of about 0·14 sec. If 0·2 sec. be taken arbitrarily as the maximum normal reading for this interval, it can be said that the series does not show an example of delayed conduction, four cases reaching this limit of normality—Cases 17, 35, 61, and 140; the heart-rate in these cases was 80, 65, 120, and 95 beats per minute respectively. The minimum P–R interval was in Case 77 and measured 0·06 sec. when the heart-rate was 90 per minute, and a similar case was No. 38, with a P–R interval of 0·08 sec., the heart-rate being 100 per minute.

6. The character of the Q R S complex in this series showed the complete absence of any evidence of intraventricular block, though it is reasonably certain that this phenomenon was present in a considerable proportion of the cases during the acute stage of the disease. The average duration of this interval was about 0·05 sec., though the limits were 0·03 sec. in one case (No. 77), with a rate of 90 per minute, and a maximum reading of 0·08 sec., which was found in Case 19, with a heart-rate of 78 per minute.

7. The R–T interval was more variable than were the other measurements given above. The reading was in the region of 0·3 sec. for the majority of the cases. There was, however, a considerable difference in the limits; the minimum (Case 77) being 0·14 sec. and the maximum (Case 154) was 0·4 sec. Thus the R–T interval was found to be within normal limits, though in two cases in which the interval amounted to 0·4 sec. the arbitrary maximum for the normal duration of this phase was reached.

The remaining characteristics contained in the detailed analysis are usually regarded as variations within normal limits, but they have been tabulated for comparison with a series in which neither diphtheria nor any other ætiological factor could be elicited in the histories. (See Table.)

Applying the χ^2 test for independence it can be shown that the differences between the numbers is attributable to chance factors except in regard to the negative or iso-electric T wave in lead III. In this case the probability of the results arising due to chance is considerably less than 1 in 100, which for this form of analysis indicates definitely a significant difference between the two figures. As the number of cases where the phenomenon is shown is adequate, this indicates a real difference between the diphtheria

cases and the control cases with regard to this characteristic.

CONCLUSIONS

From this comparison of 150 cases having a history of diphtheria with 100 cases having no history of the disease, it is at once evident that there is nothing to suggest the occurrence of gross cardiac lesions as the result of a previous attack of diphtheria. Age-grouping was therefore considered unnecessary, and although

—	Diphtheria (150 cases).	Controls (100 cases).
Average age	14 years.	12 years.
Cases excluded for other ætiological factors	4	0
Clinical evidence of valvular incompetence	5	1
P–R interval of 0·2 sec. or over ..	4	2
Intraventricular block	0	0
Splintering of R in leads I. or II. ..	9	13
Negative or iso-electric T waves in lead III.	90	30
Bizarre Q R S in lead III.	42	39
Ventricular preponderance	8	11

the number of cases in the two groups was unequal the average ages were used. The difference of two years between the average ages is mainly accounted for by a small group of young adults who were examined as "post-diphtheritic heart" cases.

In a study of the electrocardiogram during the acute phase of diphtheria [11] it was often found that the T wave in lead III. varied considerably during the course of the disease, and a patient might apparently recover clinically and functionally before the T wave in lead III. of the electrocardiogram became positive. This observation was made on an independent group of cases, but in view of the findings in the present series the question is raised as to how long such T wave changes might persist after diphtheria. It is widely accepted, however, that inversion of the T wave in lead III. is of no pathological significance, and whatever may be the cause of an increased frequency of this feature in persons who have had diphtheria, there can be no doubt that there is no coexistent clinical abnormality.

I am indebted to Dr. Claude Rundle, the medical superintendent of Liverpool City Hospitals for Infectious Diseases, for allowing free access to all the hospital registers and case-records for the past ten years. Dr. E. Noble Chamberlain, senior honorary assistant physician at the Royal Southern Hospital, Liverpool, kindly gave assistance in reporting on the electrocardiographic records, and the X ray department of the hospital carried out the photographic work for this part of the investigations. For help in the statistical analysis of the records I am grateful to Mr. John H. Smith, assistant lecturer in the mathematics department of the University of Glasgow.

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Clinical and Laboratory Notes

OBSERVATIONS ON THE CHEMISTRY OF THE LIQUOR AMNII *

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THE following short series of chemical examinations of the liquor amnii was carried out in collaboration with Mr. W. E. Barnie Adshead, hon. assistant obstetrical officer to the Queen's Hospital, Birmingham.

Except in one fatal case of pneumonia, in which the liquor amnii was obtained from the gravid uterus at autopsy, a subtotal hysterectomy was performed on each of the patients in this series, and the liquor amnii was withdrawn from the intact uterus as soon as possible after the removal of that organ from the body. Each uterus was sent directly from the operating theatre to the laboratory, where I withdrew as much of the fluid as I could obtain by aspiration with a sterile needle and syringe, after searing the surface of the organ. The chemical examinations were made upon the fluid very shortly after its removal.

The papers that I have been able to consult do not contain much detailed information about the chemical composition of the normal liquor amnii, and I have not found any reference to the chemistry of the fluid in the presence of maternal disease.

De Lee [1] gives the reaction of the liquor amnii as faintly alkaline or neutral, and the freezing-point as slightly higher than that of the maternal blood. Sandmeyer found 0·22 per cent. of albumin present, comprising serum-albumin, globulin, and an ovo-vitelline-like substance. The salts of the liquor amnii are present in about the same proportions as the salts in the blood-serum—i.e., 0·5 per cent. They are the chlorides, phosphates, sulphates, and carbonates of sodium and calcium, with very little potassium. The urea content ranges from 0·02 to 0·4 per cent., and increases towards the end of pregnancy.

Fairbairn [2] states that the normal liquor amnii is a slightly turbid, straw-coloured fluid, with a specific gravity of 1002 to 1020, and a faintly alkaline reaction. It contains a variable amount of albumin (6 to 8 parts per 1000, Esbach); urea (usually in very small quantity), creatin, and salts. Sugar is said to be present in the liquor amnii of diabetic mothers.

Eden [3] gives the following details: a clear, pale fluid of low specific gravity; albumin, 0·19 per cent.; inorganic salts, 0·59 per cent.; extractives, 0·81 per cent. The amount of albumin may reach 10 per cent. in the early months of pregnancy. The most important extractive is urea, which is present in traces from the sixth week onwards. Glucose may be found in cases of maternal diabetes.

In the accompanying Table all the figures for the various chemical estimations represent mg. per cent. The method of estimation is included in the Table, because different methods of estimation may yield different values when performed in parallel by the same worker. It is therefore necessary to state the method of estimation used in any series of biochemical investigations in order to make the work of value for comparative purposes.

The reaction and the specific gravity of the fluids examined conform to the accepted values for the normal liquor amnii. In seven out of the eight fluids tested glucose was present in estimable quantity, and in one fluid the sugar content lay within the normal range of the blood-sugar. It is not possible to express an opinion upon the relationship of this comparatively high sugar content in the liquor amnii to the clinical condition, especially in the absence of a coincident blood-sugar estimation, but the finding

* From the Biochemical Laboratory of the Queen's Hospital, Birmingham.

CHEMICAL ESTIMATIONS OF LIQUOR AMNII

Age	35	28	37	34	44	35	39	23	35
Maternal disease	Phthisis.	Phthisis.	Phthisis.	Renal insufficiency.	Albuminuria of pregnancy.	Epilepsy	Puerperal insanity.	Mitral stenosis.	Pneumonia.
Age of fœtus in months	4	5½	5	2½	4	5½	3	4½	6
Physical characters of fluid	Clear, yellow.	Turbid, deep brown.	Clear, yellow.	Clear, yellow.	Clear, yellow.	Clear, pale yellow.	Clear, pale yellow.	Clear, pale yellow.	Clear, yellow.
Reaction	Neut.	Alk.	Alk.	Alk.	Alk.	Alk.	Alk.	Alk.	Alk.
Specific gravity	1009	1011	1007	—	1006	1010	—	1007	1008
Sugar (Folin-Wu)	Trace.	22	33	43	40	—	91	40	22
Urea (Twort-Archer)	12	29	34	39	36	10	34	35	73
N P N (Folin)	—	—	—	—	32	—	—	30	—
Uric acid (Folin)	Trace.	5·7	—	—	1·4	—	3·0	4·0	—
Creatinin (Folin)	1·2	1·5	1·5	1·2	1·3	1·4	—	1·2	—
Chlorides (Van Slyke)	630	610	583	640	668	597	540	660	540
Cholesterol (Myers-Wardell)	Absent.	Trace.	Trace.	Absent.	Absent.	Absent.	Absent.	Trace.	Absent.
Calcium (Kramer-Tisdall)	9·0	6·5	7·9	—	8·7	8·8	8·4	8·0	—
Phosphorus (Bell-D'Oisy)	2·5	1·2	1·1	3·3	2·0	2·0	2·5	2·5	8·0
Total protein (Young-Bennett)	300	50	600	25	200	250	100	400	200
Globulin (Pandy)	+ +	+	—	—	+	—	—	—	Absent.
Blood	Absent.	+ +	Absent.	Absent.	Absent.	Absent.	Absent.	Absent.	Absent.
Bile-pigments*	—	—	—	—	—	—	—	—	—
Lactic acid	Trace.	+ + +	—	—	Trace.	—	—	—	—

* All fluids gave a negative reaction.

is of interest in comparison with the low readings obtained on the remaining fluids in the series. Urea was present in estimable quantity in all the fluids. The single high reading of 73 mg. per cent. is not comparable with the other readings, because this fluid was obtained at autopsy several hours after the death of the patient, when some degree of decomposition had undoubtedly occurred. The high uric acid reading of 5·7 mg. per cent. is of interest, though its significance is not understood. The relatively constant values obtained for the creatinine content of the liquor amnii, even in the presence of maternal renal disease, are of much interest in connexion with the known stability of this substance in the blood and the urine. The chloride content does not vary much from the normal content of the blood, and seems to be, like the creatinine, one of the relatively stable chemical constituents of the liquor amnii. The absence of cholesterol is of interest in view of the known importance of this substance to the body, and the precautions taken by the body to conserve its supplies. Whatever may be the value of the liquor amnii to the fœtus—and conflicting opinions are held—it is certain that the fluid is a waste product to the mother, and the absence of cholesterol in the fluid may possibly be associated with this fact. The calcium readings are fairly constant at a slightly lower level than the readings for the normal serum calcium, but it must be remembered that the fœtus is a drain upon the maternal stores of calcium and that, in consequence, the serum calcium tends to fall towards the end of pregnancy, so that the readings obtained on this series of fluids are possibly only very slightly lower than the readings of the maternal serum calcium. The high phosphorus reading of 8 mg. per cent. was obtained on a fluid removed at autopsy, and cannot be compared with the other readings in the series. The total protein content shows much variation, and the variations are difficult to explain, especially the low reading of 50 mg. per cent. in the second case of maternal phthisis.

This short series of chemical examinations suffers from two serious disadvantages: (1) the absence of coincident blood chemical analyses, and (2) the absence of any normal standards for the chemical constituents of the liquor amnii. It is not possible to rectify the second defect in a general hospital that does not cater for normal cases of labour, but it should not prove difficult to obtain an accurate knowledge of the chemical composition of the normal liquor amnii from the material available in one of the large maternity hospitals, and the above series of observations has been published chiefly in the hope that it will stimulate the prosecution of this useful work.

In conclusion I wish to express my thanks to my colleague, Mr. Adshead, for his generous collaboration, and to acknowledge my indebtedness to my technical assistant, W. R. Hackett, who has carried out most of the estimations under my supervision.

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OSTEOMYELITIS OF THE PATELLA

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A GIRL, 7 years of age, was admitted to St. John's Hospital, Lewisham, on Sept. 3rd, 1932, with a swollen left knee, which had been painful for four days. There was no history of injury. Apparently the child had not seemed well for the last five weeks—she had "just sat about and did not want to play at all."

On examination the left knee seemed to be very swollen and tender with limitation of movement in all directions. Temperature 101° F., pulse-rate 120, respirations 30. Hot fomentations were applied every four hours to the knee. A skiagram showed no bony changes of the knee-joint. On Sept. 7th an incision was made over the swelling, which proved to be a suppurative bursitis, and pus was evacuated and a drain inserted. By the 22nd the wound was healed.

On Oct. 4th she was *readmitted* with very severe pain in the left knee and was unable to extend it; since her discharge she was said to have been jaundiced several times. On examination the left knee seemed to be swollen, and was warmer than the other knee, and limitation of movements, especially those of flexion and extension, was marked. A skiagram showed mottled rarefaction of the patella with ? periosteal reaction. The pain disappeared in a few hours. Temperature 101° F., pulse-rate 120, respirations 30. On Oct. 11th an incision was made down to the periosteum, which was retracted, and three holes were drilled in the upper part of the patella, which was soft and necrotic in parts. During this procedure fluid was seen to exude from the joint. The wound was packed with paraffin and flavine gauze. Bacteriological examination revealed a growth of *Staphylococcus albus* on culture. On Nov. 4th the child knocked her knee and profuse hæmorrhage occurred from the wound, which had practically healed. By the 12th the local condition had cleared up completely, without any stiffness of the joint. A skiagram showed some sclerosis of bone in the patella.

The chief features of interest in this case seem to be: (1) There was no history of previous exanthemata or injury. (2) The condition started as a suppurative bursitis, which apparently cleared up but either predisposed to succeeding infection or some of the causative bacteria remained in a quiescent state and later came into a state of activity. (3) Since the operation there has been no indication of involvement of the knee-joint, although *Staphylococcus albus* was obtained from the swab which was taken from the knee-joint.

I have to thank Mr. W. E. Tucker for permission to publish this report.

AN UNUSUAL JARISCH-HERXHEIMER REACTION

ACUTE SPINAL THROMBOSIS OCCURRING DURING THE TREATMENT OF PRIMARY SYPHILIS WITH NOVARSENOBILLON

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A survey of the recorded examples of the Jarisch-Herxheimer reaction has failed to reveal a case similar to the following.

A male patient, aged 30, unmarried, attended the special department at the Metropolitan Hospital on Nov. 27th, 1931, on account of a sore on the penis for three weeks. There was a history of risk of infection 12 weeks previously in the West Indies. A meatal chancre and enlarged glands in both inguinal regions were found. Spirochætes were demonstrated by Dr. H. C. Lucey in serous discharge from the chancre. The Wassermann reaction of the blood was negative.

At his first attendance novarsenobillon (0·45 g.) was given intravenously, and bismuth cream (2 c.cm.) intramuscularly without ill-effects. One week later these doses were repeated, and on waking the next morning the patient noticed weakness in both legs, and during the day developed difficulty in starting micturition. Both these symptoms rapidly increased in severity and within 24 hours the patient was unable to move his legs, and there was a constant dribble of urine. Four days after the onset of the symptoms (Dec. 11th) he was brought up to the hospital and admitted under the care of Dr. C. Worster-Drought.

On admission there were signs of a transverse lesion of the spinal cord at the level of the fourth thoracic segment. Both rectus abdominis muscles were completely paralysed, the bladder was distended up to the level of the umbilicus, there was retention-overflow of urine, and incontinence of fæces. The lower limbs were completely paralysed, the knee-jerks were just present on the right side and absent on the left side. The plantar responses were extensor on both sides. There was loss to pain, thermal, and light-tactile sensibility below the level of the fourth dorsal segment, above which no abnormal physical signs were detected.

Lumbar puncture was performed. The cerebro-spinal fluid was clear and under reduced pressure. Dr. Lucey reported as follows:—"Appearance: clear, colourless, contains no coagulum. Cells: 1 per c.mm. Total protein: 18 mg. per 100 c.cm. Wassermann reaction: negative."

A diagnosis was made of acute specific spinal thrombosis precipitated by the administration of novarsenobillon. It was decided to continue the course of novarsenobillon up to a total dose of 4·5 g., in addition to which potassium iodide grs. 50 was given three times daily by mouth, and collosol mercury 5 c.cm. intramuscularly at weekly intervals.

Recovery ensued as follows:—

Two weeks after admission the level of sensory loss began to be slightly lower. There was some return of tone in the recti muscles. Daily massage to the lower limbs was instituted. Three weeks after admission the sensory level was at the first lumbar segment. For the first four weeks the bladder had to be drained by a catheter. The urine became heavily infected, and this was cleared by the administration of neotropine grs. 3 three times daily by mouth.

Four weeks after admission the recti muscles were normal, the abdominal reflexes were present, and urine was passed naturally after some difficulty in starting. There was slight return of power in the legs, which were markedly spastic, the knee-jerks being very brisk, the ankle-jerks present, and the plantar responses still extensor.

Five weeks after admission micturition and defæcation were almost normal. The muscular power of the legs was rapidly returning. The knee- and ankle-jerks were all exaggerated; the plantar responses were extensor, and bilateral sustained ankle-clonus was present. The sensory loss was now down to the level of the fourth lumbar segment.

After six weeks in bed the patient was allowed to get up, the legs being very stiff at first, but walking gradually improved up to the end of the twelfth week after admission, when he was discharged.

Lumbar puncture was repeated before his discharge, and the Wassermann reaction of the cerebro-spinal fluid was again found to be negative. The blood Wassermann reaction was also negative. On discharge (March 2nd, 1932) the patient walked with the aid of a stick with a lightly spastic gait. The knee- and ankle-jerks were all brisk, the plantar responses extensor, and ankle-clonus was present on the right side. There was slight sensory loss to pain at the first sacral segment.

Treatment with potassium iodide (grs. 50 t.d.s.) was continued, and, on examination four months after discharge, the patient was walking well without a stick. There was very slight weakness and spasticity of the right leg. The knee- and ankle-jerks were still exaggerated, more on the right side, but the plantar responses were flexor, with no ankle-clonus. There was no sensory loss. Slight hesitancy of micturition was still present.

The Jarisch-Herxheimer reaction has been attributed either to the effect of endotoxins liberated from spirochætes destroyed by a specific spirillicidal agent, or to stimulation of the spirochætes by an inadequate dose of the drug. In several cases the reaction has been observed in the cranial nerves, the optic, facial, and auditory nerves being affected. Wechselmann [1] has described a case in which facial paresis occurred two hours after an injection of salvarsan. No case of acute spinal thrombosis or of acute transverse myelitis occurring as a Jarisch-Herxheimer reaction appears to have been recorded.

My grateful acknowledgments are due to Dr. Worster-Drought for permission to publish this case, and to Dr. Lucey, who performed the pathological investigations.

[1] Die Behandlung der Syphilis, Berlin, 1911.

MEDICAL SOCIETIES

MANCHESTER MEDICAL AND PATHOLOGICAL SOCIETIES

A JOINT meeting of these societies was held on Jan. 11th, with Prof. E. D. TELFORD in the chair. A paper on

Grades of Immunity

was read by Prof. W. W. C. TOPLEY (London). The term immunity, he said, does not define an entity, the characters of which we can describe with precision. It is a loose generic term that covers all grades of resistance beyond complete susceptibility up to that ideal, and perhaps hypothetical, condition in which a person is entirely indifferent to the attacks of a potentially pathogenic parasite. We can recognise several different grades of immunity, though we cannot separate them sharply from one another. In the case of an invasive parasite complete susceptibility is associated with an acute bacteræmic type of infection, almost uniformly fatal, with minimal local lesions. A low grade of partial immunity is associated with less frequent or less severe bacteræmic infections, more frequent and rather more extensive local lesions, and occasional cases of latent infection. With partial immunity of a moderate grade bacteræmic infections decrease still further in frequency and severity, and the local lesions dominate the clinical picture, while latent infections become more frequent. With partial immunity of a high grade bacteræmia is rare or absent, the local lesions are slight or minimal, and latent infections are the rule. As this grade passes into complete immunity latent infections become less and less frequent, until the parasite can no longer find any foothold in the host's tissues. The clinical syndrome displayed by many of our commoner infective diseases is an expression of partial immunity; and immunological methods of prevention and cure must be regarded, in most cases, as procedures that allow us to increase resistance from a lower to a higher grade, rather than to confer solid immunity on an initially completely susceptible host. Such minor changes in resistance may be of considerable value in the prevention or treatment of infective disease; but—because they are minor changes—their effect is difficult to measure, and there is a risk of persisting with a useless method, or of neglecting a valuable one. The assessment of any immunological method of prevention or cure demands close coöperation between the laboratory worker and the clinician or epidemiologist, and adequate data can seldom be obtained without a carefully planned group inquiry on an extensive scale. Preventive inoculation against typhoid fever, against the common cold, or against diphtheria, and the serum treatment of pneumonia or of poliomyelitis, afford instances in which we have obtained some measure of the actual effect in man. There are, however, very many cases in which we have as yet no knowledge of the real value of a possibly useful procedure, and it is very desirable that steps should be taken to remedy our ignorance, and so to place our practice on a firmer scientific basis.

At a meeting of the Pathological Society on Feb. 8th, Prof. S. L. BAKER discussed

Intrarenal Obstruction during the Excretion of Hæmoglobin

He said that the excretion of large quantities of hæmoglobin, as in blackwater fever, might produce severe renal damage. The renal lesion consisted in an obstruction of the tubules by granular material derived from hæmoglobin and precipitated in the tubules during the course of excretion. A similar obstruction might occur during the hæmoglobinuria that follows the transfusion of incompatible blood; in this case there was a rapid intravascular hæmolysis of the transfused corpuscles. Two such cases in which fatal renal obstruction followed the transfusion of incompatible blood were studied by S. L. Baker and E. C. Dodds (1925), and it was shown that death resulted from blockage of the intrarenal tubules by granular material derived from hæmoglobin. The factors determining this precipitation were (*a*) the hydrogen-ion concentration of the urine, (*b*) the salt content. If the patient were excreting an acid urine (pH 6 or less) with a salt content of 1 per cent. NaCl or over, such precipitation was likely to take place. This precipitate was hæmatin. A similar intrarenal precipitation could be produced in rabbits by the intravenous injection of hæmoglobin solutions if the animal's urine were rendered acid, as by cutting off the supply of green food. If the urine were alkaline the hæmoglobin was excreted unchanged, and no ill-effects on the kidney were produced.

In all conditions in which hæmoglobinuria occurred it was important to make the urine alkaline, and so avoid the possibility of intrarenal obstruction.

LIVERPOOL MEDICAL INSTITUTION

AT a meeting of this institution on Feb. 9th, with Dr. H. R. HURTER, the president, in the chair, a note on the

Diagnosis of Acute Pancreatitis

was read by Mr. C. A. WELLS. His object, he said, was to quarrel with the common belief that the diagnosis of this condition was almost impossible until after the abdomen had been opened, and also to draw attention to a sign which was not generally described. For descriptive purposes cases were divided into two classes: (*a*) the fulminating, in which Moynihan spoke of "profound collapse and unendurable agony"; and (*b*) the less fulminating, which at present seemed to be the commoner. Attention was chiefly directed to the second and larger group.

Mr. Wells believed that a pre-operative diagnosis could and should usually be made. The condition was suggested by the onset of pain, both in the upper abdomen and back, combined with the discovery on physical examination of a distinct upper abdominal localisation, possibly a sense of soft fullness and commonly incomplete rigidity. The diagnosis having been suggested by these findings could be confirmed by certain signs and tests:—

(1) *Loewi's sign.*—Most writers agreed that this was worth trying, but was not always positive in proved cases, whilst it might be positive in cases other than pancreatitis. The speaker's experience was that the sign was interesting but of small value.

(2) *Cyanosis.*—(*a*) A vague degree of cyanosis, associated with collapse and difficulty in breathing. (*b*) Patches of discoloration in almost any part of the body, generally agreed to be almost diagnostic but obviously very rare. (*c*) Grey Turner's sign of staining in the left flank, clearly a late manifestation of the disease.

(3) *Metabolic changes.*—The only reliable change in this group seemed to be the increase in diastase, and owing to

the fact that it involved a laboratory test the sign was omitted as not being of clinical interest in most urgent cases.

(4) *Deep tenderness in the left costo-muscular angle.*

Mr. Wells was convinced that this last sign was of great value in arriving at a diagnosis. Its presence was no doubt explicable on the assumption that the pressure was transmitted to the tail of the pancreas. He had so far failed to find any specific reference to this sign, except in one American text-book (Homans's), which said: "more especially is tenderness in the left costo-vertebral angle, due to inflammation of the tail of the pancreas, of great diagnostic significance."

In the discussion which followed, the PRESIDENT said he had hitherto regarded acute pancreatitis as undiagnosable; certainly surgical treatment had usually to precede diagnosis. In the few cases he had seen the symptoms and physical signs were so alarming that an urgent laparotomy was obviously indicated, and only during its performance was the diagnosis made. In his last case, a man of 51 was in perfect health until one hour after an unusually hearty meal of curried veal, when violent pain began in the upper abdomen. This was unrelieved by morphia, and 20 hours after its onset operation disclosed an acutely inflamed pancreas and the usual fat necrosis. The man recovered rapidly.

Dr. I. HARRIS read a paper on a Method of Measuring the Force required to Compress an Artery, and Mr. BRYAN MCFARLAND a paper on the Treatment of Congenital Club-foot.

REVIEWS AND NOTICES OF BOOKS

Diseases of the Eye

Practitioners Series. By ANDREW RUGG-GUNN, M.B. Edin., F.R.C.S. Eng., Surgeon to the Western Ophthalmic Hospital. London: William Heinemann (Medical Books), Ltd. 1933. Pp. 188. 12*s.* 6*d.*

FOR the general practitioner who does not profess to specialise on the eye there is already a choice of text-books, but this is certainly one of the most practical and useful yet produced. No attempt is made to deal with those parts of the subject which are more properly left to the specialist—that is, all operative procedures, refined diagnosis of fundus conditions, and the optical diagnosis and treatment of errors of refraction. All the more common types of ocular disease, however, are efficiently dealt with, and we would specially commend the detail with which the treatment of comparatively trivial diseases such as the more common inflammations of the conjunctiva and eyelids is discussed.

The lesions of the eye are described always in such a way as to emphasise their association with disease elsewhere. Interstitial keratitis, for instance, has long been known to be a manifestation of congenital syphilis, but the fact that most cases tend to get well without specific treatment has had the result that in the past many ophthalmic surgeons have not considered it necessary to employ it. Mr. Rugg-Gunn takes the contrary view, which has been expressed even more strongly by Mr. Lindsay Rea, a colleague of his at the Western Ophthalmic Hospital. Some remarks on various methods for the medical treatment of cataract, none of which is recommended, may be found useful by the practitioner who has to deal with patients anxious to know if any non-operative treatment is likely to be effective. In dealing with primary glaucoma Mr. Rugg-Gunn mentions the two conflicting views of its pathology which are now held without supporting either. The commoner diseases of the fundus are well described and some of them pictured. Concerning detachment of the retina, a condition which it is important for the practitioner to be able to recognise, information concerning the encouraging results of modern methods of operative treatment is up to date, although it is fairly certain to need elaboration before the next edition of the book is published. The differential diagnosis between paralytic and concomitant strabismus comes within the scope of the general practitioner; this book will help him to make it. The importance of recognising true squint in children at the earliest possible time is perhaps hardly sufficiently emphasised here. The figures, so far as they go, are useful; one of them pictures a useful form of bandage not generally known, and there are eight excellent plates. Two of them are noteworthy: one shows a photograph of the ciliary processes and zonule of Zinn taken from behind, and another shows the radiogram of an injected mucocele on one side and an injected normal lacrymal sac and nasal duct on the other.

The practitioner will find this book really helpful.

Les sequelles de l'encéphalite épidémique

By GEORGES GUILLAIN and PIERRE MOLLARET (La Pratique Médicale illustrée). Paris: G. Doin et Cie. 1932. Pp. 106. Fr.28.

WHEN encephalitis lethargica was first recognised in its acute form (1917–18), certain manifestations, such as an alteration in the mental condition, residual cranial nerve palsies, athetoid movements, and paresis were observed in a limited number of patients who in other respects had recovered from their attacks of illness, and the original investigators expressed concern about the possible risks of after-effects in the disease. We know now that this concern was fully justified. As early as 1921 the subject of post-encephalitic paralysis agitans (Parkinsonism) was brought forward by Prof. Netter at the Congress of the Société de Neurologie de Paris. In 1922 the Ministry of Health Report on Encephalitis Lethargica was able to furnish a lengthy list of sequelæ. Since then we have had comprehensive descriptions of the types and associated signs and symptoms of encephalitic after-effects from Gabrielle Lévy in France, from C. von Economo in Austria, and from A. C. Parsons in this country. There is, in addition, a large and increasing amount of literature on the subject dealing with individual groups of cases. The great frequency of the parkinsonian syndrome is a marked feature of continental reports. The manifestations of the after-effects of encephalitis lethargica may be grouped into (*a*) those appearing in the course of the original acute malady and persisting after partial or complete disappearance of all other symptoms, and (*b*) those which ensue after the original acute malady has apparently terminated or in some cases has passed unrecognised. Such effects are declared after a latent period of extreme variability ranging from some weeks to two years. In some reported cases the after-effects cleared temporarily, but reappeared some months later. No definite opinion, therefore, can be expressed until after the lapse of some years as to whether an attack of encephalitis, however mild in appearance, may or may not result in serious sequelæ. The general and merciful decline in new cases of encephalitis

lethargica has caused attention to be even more intently focused on the character of the sequelæ which concern the different domains of neurology, psychiatry, general pathology, and legal medicine.

This monograph reviews and assembles in succinct form the protean manifestations of the disease and provides a useful introduction to more intensive study of the subject.

Protoplasmic Action and Nervous Action

Second edition. By RALPH S. LILLIE, Professor of Physiology, University of Chicago. The University of Chicago Press. 1932. Pp. 417. 16*s*. 6*d*.

Prof. Lillie is well known as a worker in general physiology, using that term in its most modern sense. The field covered by this work is very wide, and contains expressions of personal opinions and interpretations which would not be universally accepted. The 15 chapters in the book deal with the consideration of physiology from a purely cellular point of view. Chapter IV. is perhaps the most interesting since it deals with protoplasm as a physical system. A wider discussion of catalysis in living matter, and a separate chapter devoted to the energetic considerations of living matter would have been useful. The general question of oxidation and reduction by living tissue is hardly dealt with at all.

It is, however, somewhat presumptuous to suggest what should or should not be included in a monograph, for, while a text-book must conform to pattern, the author of a monograph may surely limit its scope at his pleasure. Prof. Lillie has given us an ably written and stimulating collection of essays.

A Manual of Bacteriology, Medical and Applied

Ninth edition. Revised by R. T. HEWLETT, M.D., F.R.C.P., D.P.H. Lond., Emeritus Professor of Bacteriology in the University of London; Director of Pathology, Seamen's Hospital, Greenwich; and JAMES MCINTOSH, M.D., B.Ch., Professor of Pathology, University of London; Director of the Bland-Sutton Institute of Pathology, Middlesex Hospital. London: J. and A. Churchill. 1932. Pp. 746. 18*s*.

IN the production of this edition of his classic text-book, which first appeared in 1898, Prof. Hewlett has had the collaboration of Prof. James McIntosh. The invigorating effect of this infusion of new blood is noticeable in a book which has always been characterised by its wide scope and the well-balanced presentation of the subject. The work has been completely recast in somewhat larger type, so that the addition of a further 100 pages does not represent its bulk of new matter. All the sections have been carefully overhauled and some of them rewritten, notably those on undulant fever, diphtheria, spirochætal diseases, and the virus diseases and bacteriophagy. The last-named chapter is especially interesting and well written. In this chapter Plate XLI., B. appears to illustrate variolar encephalitis, whereas the text (p. 612) suggests that the condition shown is post-vaccinal encephalitis. The figure may mislead in so far as it does not indicate the characteristic perivascular demyelination of post-vaccinal encephalitis to which Prof. McIntosh himself primarily called attention, although he holds the view that the two forms of encephalitis are closely related. The table of blood groups (p. 196) might puzzle a student who adopts the prevalent Moss nomenclature; the bacterial mill, illustrated on p. 38, is held by many who have tried to use it to be an unsatisfactory piece of apparatus. Such questions, however, may be largely a matter of personal preference. We can commend this book as a thoroughly sound text-book of bacteriology. The ground is covered very thoroughly, and the relation of medical bacteriology to pathology and public health is admirably maintained.

Anatomy (Upper Extremity)

Catechism Series. 4th edition. By C. R. WHITTAKER, F.R.C.S.E., F.R.S.E. Part I. Edinburgh: E. and S. Livingstone. 1932. Pp. 80. 1*s*. 6*d*.

THE issue of books such as this are deprecated by anatomists, but welcomed by students anxious to pass an examination. This is a good collection of questions of the sort commonly asked in ordinary examinations in descriptive anatomy, with model answers. These answers, as might be expected from the reputation of the author, are thoroughly sound, and, within its limits, the little book can be recommended to students.

La Belgique Sociale

By Dr. RENÉ SAND, Agrégé de l'Université de Bruxelles; Membre des Conseils supérieurs de l'Assistance, de l'Instruction publique et des Œuvres de l'Enfance. Brussels: J. Lebègue et Cie. 1933. Pp. 196. Belg. fr.18.

Dr. Sand, who is the technical counsellor to the League of Red Cross Societies and president of the International Hospital Association, has used his wide experience of international affairs as a background in this study of public health and social welfare in his own country. The book deals almost exclusively with Belgium; yet it is easy to read between the lines that the praise the author allots, and the judgments he passes on matters in his own country largely reflect his intimate knowledge of what is happening elsewhere. His account of the public health and social welfare machinery starts from the year 1830. From then onwards there has gradually developed a patchwork garment with which the community has been clothed in a rather helpless fashion. Dr. Sand emphasises his running comments on this patchwork with statistics and other data which make his book not only a powerful plea for reforms, but also a valuable summary of what is being done to-day with regard to such problems as housing, food, infectious and mental diseases, alcoholism, cancer, infant and maternal welfare, sickness and accident insurance, occupational diseases, unemployment, and all the many other subjects with which public health and social welfare are concerned. Rural hygiene—a problem whose importance and urgency have but recently been discovered—receives special attention; and Dr. Sand shows how glaringly defective is the hygienic state of many a rural community in Belgium. The administrative autonomy such communities "enjoy" in the matter of public health is their undoing. For how can local talent, in the few spare moments it can devote to public affairs, grapple satisfactorily with the highly technical problems of a modern community? Dr. Sand's remedy for all this is centralisation. And at the centre he would like to see one body, not 15 bodies, as is the case at present, overlapping each other with great and unnecessary loss of efficiency. The conditions here revealed have so many parallels in other countries that this book will be read with sympathetic interest by many besides the Belgians.

THE LANCET

LONDON: SATURDAY, FEBRUARY 25, 1933

WORKMEN'S COMPENSATION—ACCIDENT OR DISEASE?

LIKE the original statute of 1897, the present Workmen's Compensation Act of 1925 awards compensation for "personal injury by accident." But what does "accident" mean? The House of Lords a week or two ago, in Partridge Jones and John Paton Ltd. *v.* James, carried a little further the accepted extension of "accident" to the cases where the workman, as Lord Shaw once said, is carrying about with him a fatal disease. The husband of Mrs. James (the respondent) suffered from disease of the coronary arteries. His work consisted of drossing—i.e., dipping metal sheets in a pot of dross, taking the sheets out and finally cleaning the dross from the pot. He finished cleaning out the dross one day at 12.30 P.M., stepped from the staging, exclaimed "Oh! my chest," and died within ten minutes. The county court judge held that the disease of the arteries caused a failure of blood-supply resulting in angina pectoris; the physical exertion of performing the man's ordinary work accelerated death and caused death to occur when it did. He held that this was "personal injury by accident" and awarded compensation. The Court of Appeal and the House of Lords have upheld the award. The personal injury would not have happened but for the disease; nevertheless the combination of disease and employment made it a personal injury by accident.

In Clover Clayton & Co. *v.* Hughes (1910) Sir John Simon tried hard to persuade the judges that injury by disease cannot be injury by accident. The Act, he said, says injury by accident, not injury by the work which workmen are doing. He was dealing with the death of a workman who suffered from an aneurysm in such an advanced condition that it might have burst during sleep; very slight exertion or strain would have been sufficient to cause a rupture. The man was merely tightening a nut with a spanner; he had given a couple of turns only where half a dozen turns were required. It was an ordinary operation involving no special strain, but the aneurysm burst and he died. The House of Lords decided that it was an accident arising out of his employment; Lord Macnaghten explained why. An aneurysm, he said, is understood to be an unnatural or abnormal dilatation of an artery; still, it is part of the artery and so of the man's body. The man "broke part of his body," as Lord Robertson said once (in Brintons *v.* Turvey), and he certainly did not mean to do it.

"The fact that the man's condition predisposed him to such an accident seems to me to be immaterial; the work was ordinary work but it was too heavy for him. . . . The fact that the result would have been contemplated as a certainty by a medical man of ordinary skill if he had diagnosed the case is, I think, nothing to the purpose."

The judges interpreted accident in the popular sense of the word. We meet with an accident if we miscalculate our powers. Lord Atkinson took a contrary view, but Lord Macnaghten's view prevailed. Even if judges feel that a series of decisions has pushed the law into a position which Parliament never dreamt of when the original Workmen's Compensation Act was passed, the House of Lords had settled the position and it was bound recently to follow its own ruling.

There was once much judicial uncertainty in the matter—partly because the higher courts felt themselves bound by the findings of fact and these findings varied greatly. A generation ago the judges had to deal with several claims for compensation by workmen injured in the course of ordinary work. It was no use to argue that accident must connote some outward injury, for on this basis the seaman who fainted in the rigging and fell into the sea might fail to obtain compensation. It was equally useless to contend that accident must be something caused by an untoward external event like the bursting of a boiler or the misbehaviour of a machine; a workman's hand can be crushed between two wheels when the machinery is working perfectly. In Hensey *v.* White (1900) a workman, physically unsound, had strained himself in turning the wheel of his machine. The arbitrator held it was not an accident and the Court of Appeal agreed. In Roper *v.* Greenwood (1900) a woman, suffering from prolapsus uteri, strained herself in carrying heavy boxes in the course of her work; this again was held not to be personal injury caused by accident. But in the same year in Timmins *v.* Leeds Forge Co. a workman, who strained himself in trying to lift planks which were frozen together, was held to have been injured by accident. Two years later in Boardman *v.* Scott a man had been carrying a heavy beam and, in jerking it to get it level on his shoulder, he lacerated the muscles of his back; this was deemed accident. Finally in 1903 in Fenton *v.* Morley, where a workman had ruptured himself in doing his ordinary work of turning a wheel, the House of Lords unanimously held it was personal injury by accident. This decision overruled Hensey *v.* White (where the facts had been almost identical) and many other cases. The judges definitely state that the employers must pay compensation for internal injuries occurring in the course of a workman's employment no matter what the state of his health. Thus the cases where a man "carries about with him a fatal disease" become a serious industrial problem. If a more frequent and systematic examination of the workman's physical condition will help to solve the problem, how are we to set about it?

ALLERGY IN RHEUMATISM AND GOUT

AFTER histological study of rheumatic nodules and joint lesions and gouty tophi, M. P. WEIL and J. DELARUE[1] have come to the conclusion that

[1] Presse Méd., 1932, xli., 1969.

these lesions are all essentially the same, and have a common origin in tissue supersensitiveness or allergy. The significant features of the process are "fibrinous" necrosis, peripheral cellular infiltration, and a fibroblastic reaction leading to encapsulation of the lesion. The necrosis may be inconspicuous, as in the well-known Aschoff bodies of acute rheumatism, or it may be extensive and liable to calcareous and uratic deposits, as in gouty tophi.

Of late years the notion that allergy governs rheumatic fever has gained much ground, whilst the theory that it influences gout has also found supporters. H. F. SWIFT [2] recalls that as long ago as 1902, before the development of the modern theory of allergy, A. MENZER suggested that rheumatic lesions were dependent not so much on actual bacterial invasion of the tissues as on some mechanism involving the union of bacteria and their antibodies in the tissues. Since then, with the recognition of the Arthus phenomenon, and because of the occurrence of polyarthritis in serum disease, many workers have been attracted to the allergy hypothesis. Joint lesions have been experimentally produced in appropriately sensitised animals by injections of non-hæmolytic streptococci and other antigens; allergic skin reactions to streptococcal vaccines and filtrates have been demonstrated in rheumatic subjects; and the various investigations have been summarised in critical and comprehensive reviews—among others by SWIFT [2] and by H. ZINSSER and H. YU in 1928. Allergy in gout has received less attention but some suggestive observations have nevertheless been recorded. L. J. LLEWELLYN put forward the hypothesis in our columns in 1922, and later F. GUDZENT subscribed to it. These and other writers have drawn attention to the familial distribution of gout, and to the occurrence of skin rashes in gouty persons, as supporting the hypothesis. F. WIDAL and his colleagues in 1925 demonstrated cutaneous supersensitiveness to certain wines, especially red burgundy, in gouty subjects. At this point mention may also be made of the disease known as hop-gout, seen among hop-pickers in Kent, which is characterised by acute joint and tendon lesions, and seems (as B. M. SMITHIES [3] remarked) to be a manifestation of supersensitiveness to the hop or to something connected therewith. If a disease that resembles podagra closely enough to merit the colloquial name hop-gout can be explained in terms of allergy, it seems not unlikely that true gout is susceptible of similar explanation. Evidence of this kind is, of course, far from sufficient to turn the tide of opinion away from belief that the disease is due to an error of metabolism, but it is interesting to observe that an excess of uric acid in the blood and an abnormal excretion of this substance, which have so long been the centre of interest in the study of gout, are now found to be also features of the allergic state. For example, H. W. BARBER and G. H. ORIEL,[4] who studied the blood chemistry of patients suffering various manifestations of allergy, not specifically including gout, found that during the acute attacks there was a rise of amino-acid, uric acid, and creatinine, and that the urinary excretions before and afterwards fluctuated accordingly. Thus uric acid seems to be in danger of losing its claim on gout; and of course it is well known that urate deposits are by no means essential to gouty lesions.

Airy and disjointed as these observations may be, they indicate a case for consideration, and the purely histological findings recorded by WEIL and DELARUE may serve as a useful connecting link in the study of allergy in relation to articular diseases.

[2] Jour. Amer. Med. Assoc., 1929, xcii., 2071.
[3] THE LANCET, 1929, ii., 494. [4] Brit. Med. Jour., 1928, ii., 880.

TRANSFERENCE OF DEXTERITY

A POPULAR belief is that training at one type of dexterity assists in acquiring another type; that is to say, that if a player has acquired dexterity at rowing or cricket, for example, he will acquire dexterity at golf or tennis more quickly than if he had not previously become a skilled player at anything. This popular belief can neither be proved nor disproved, for there cannot be controlled experiments. Some people have a natural flair for games, and it would be easy to cite examples of men who have been successful in several branches of sport; but for the most part they played all these more or less simultaneously, and one cannot say that the training of one game was a preliminary to any other. There are indeed odd cases of great lawn tennis players who took up golf comparatively late in life and did very well at it, but even so they might have done as well—if not better—had they started with golf; and there is one department of athletic skill in which the evidence points in the opposite direction, for it seems to be agreed that few rowing men become prominent at any other form of sport taken up later; nor does any other sport, pursued concomitantly, help to make an oarsman. On the other hand many supporters could undoubtedly be found for the argument that, even if rowing is an exception, dexterity in sport can be transferred to a considerable extent in accordance with individual proclivity.

Similarly in industry the view has been held that training in one kind of manual skill can be transferred to another, and here it may prove possible to devise controlled tests yielding trustworthy information. This has been attempted in a prolonged and careful investigation by the Industrial Health Research Board, a pertinent report from which department has just appeared.[1] In an introductory note Prof. PEAR defines the terms "skill" and "dexterity" for the purpose of this report. Skill is taken to be an integration of well-adjusted muscular performances; it is applied to the higher, more complex integrations of performance, the term dexterity to the simpler patterns of specific habits. Simple dexterity only was the subject of the present study, in which boys were called upon to perform manual processes,

[1] Manual Dexterity: Effects of Training. I. Transfer of Training in Manual Dexterity and Visual Discrimination. By E. M. Henshaw, P. Holman, and J. N. Langdon. II. Distribution of Practice in Manual Dexterity. By E. M. Henshaw and P. Holman. Medical Research Council: Industrial Health Research Board. Rept. No. 67. H.M. Stat. Office. Pp. 45. 1s.

being given, through a daily bonus, an adequate incentive to do their best. In no case was training at one process found of value when taking up a second process; in other words there was no "positive transfer" of dexterity. A view has also been put forward that the acquirement of dexterity at any process creates a habit which stands in the way of acquiring dexterity at some other process; in the field of sport, rowing coaches agree that those who have learned their rowing while engaged in sea fishing prove difficult pupils in racing eights. No evidence, however, was found to support a theory of negative transfer. On the other hand, the Board's inquiry reveals instructive facts about the best period of daily training for increasing productive speed. Eighty minutes' training per day in the simple process of chain assembling was found to give just as much improvement as double this length. Hence, where rapid training is required, a subject could be trained advantageously at one process in the morning and at another process in the afternoon without either interfering with the progress of the other. (Such results would appear to support the scheme of training adopted by that well-known athlete, Pollock Hill, who is famed for having won on the same day the mile and the three-mile in the Inter-varsity Sports. This athlete used to go out on the track each afternoon and train as if for the mile event; then he came into the pavilion and rested quietly for over an hour; after which he went out again to train for the three-mile event, as if he had not been previously on the track.) The best training period for chain assembling may be even below 80 minutes. Discussing the length of spell advantageous for maximum efficiency, the report found a four-hour spell too long; on the other hand, the introduction of rest pauses in a two-hour spell of work did not help. Adjustment to the length of work-spell, indicated by a slower rate of work, took place in a four-hour spell; but it was not shown in any spell shorter than four hours. A tendency to variability in the rate of output was found to increase with the length of work-spell; this variability increased with the onset of fatigue, and indeed was a more sensitive measure of its onset than any actual decrease in output. The more efficient subjects were found on the whole to produce a more constant output—that is to say, their work curves of output were maintained hour by hour at a constant level, just as a well-trained long distance runner maintains the same pace lap after lap over a ten-mile distance.

This question of transfer is part of the larger question of the relations existing between types of human skill, the nature and extent of which was discussed in an earlier report [2] of the Board which answered to some extent the popular criticism levelled against our public schools, that its gods are recognised in its athletes and not in its intelligentsia. Dr. A. A. MUMFORD, whose studies of the physical measurements of schoolboys are well known, has now taken much of the sting out of this gibe by showing that the gods, as a matter of fact, combine both attributes. Examination of 797 boys attending the upper part of the Manchester Grammar School leads to the conclusion [3] that physique and scholarship are in general correlated. Amongst a group of boys all winning "colours" at games or sports, those with advanced scholastic attainments are more advanced in growth than those of lower mental attainments, their advantage being shown in height, weight, chest girth, and vital capacity. Similarly amongst boys none of whom do well at sports the better scholars show the better physical measurements. When various forms of athletics are considered it is found that the group of most advanced scholarship boys show to more advantage in team games than in feats of individual prowess, which suggests that their greater intelligence assists them materially in the combined forms of sport. Following the history of those boys who went to Oxford or Cambridge, we see that those who obtained first-class university honours had won more games colours and sports credits while at school than those who obtained only second-class honours, while the latter in their turn had obtained more colours and credits than those who gained only third-class honours. In this material there is no doubt of the correlation between brain and brawn.

[2] Report No. 64. A Classification of Vocational Tests of Dexterity. By A. E. Weiss-Long and T. H. Pear. 1s. 3d.
[3] Jour. of Hyg., January, 1933, p. 80.

ANNOTATIONS

A HOSPITAL SURVEY OF LONDON

LAST week-end was issued the first complete survey ever made of the services available for the sick poor in the County of London. Such a survey was rendered possible when the Local Government Act of 1929 placed under the London County Council the whole of the publicly provided hospital services for London, formerly under the management of the Metropolitan Asylums Board and the several boards of guardians, which Act created at the same time a consultative body representing the voluntary hospitals, known as the London Voluntary Hospitals Committee. The survey [1] consists of two parts, one dealing with the voluntary hospitals, clinics, and dispensaries, prepared by the hospitals committee, of which Lord Riddell is chairman and Dr. Geoffrey Evans hon. secretary; the other dealing with the municipal hospitals, clinics, and dispensaries, prepared by the London County Council, under the guidance of Sir Frederick Menzies. Both surveys are for the calendar year 1931, and the latter especially must be regarded as provisional, inasmuch as the process of bringing the public health institutions fully into use for the purpose for which they were allocated is still proceeding as circumstances permit.

[1] Joint Survey of Medical and Surgical Services in the County of London. Part I., Voluntary Hospitals, Clinics and Dispensaries. Prepared by the London Voluntary Hospitals' Committee. London: P. S. King and Son. Pp. 53. Price 2s. Part II., Municipal Hospitals, Clinics and Dispensaries. Prepared by the London County Council, and including information furnished by the Metropolitan Boroughs' Standing Joint Committee as to Medical Services provided by the Metropolitan Borough Councils. No. 2947. Published by the London County Council and obtainable through Messrs. P. S. King and Son. Pp. 41. Price 2s.

The London County Council is now spending well over £7,000,000 a year in maintaining 79 general and special hospitals, convalescent hospitals, and institutions, 49 dispensaries for giving outdoor medical relief, 13 institutions under the management of its public assistance committee, and 20 mental hospitals, colonies, and homes under the management of its mental hospitals committee. In addition the Council is spending nearly £450,000 a year on the medical inspection and treatment of school-children, including 73 voluntary treatment centres and arrangements with 17 voluntary hospitals. The survey shows that the total number of beds for sick persons in the Council's hospitals and institutions, apart from mental, at the end of the survey year was 38,945. The total number of in-patients treated in the year was 210,074 (of whom all but 5535 were resident in the county), and out-patient attendances numbered 259,036. The corresponding number of beds in voluntary hospitals was 14,833, the total number of new in-patients treated during the year 216,788 (of whom 79,385 came from outside the county), and the total out-patient attendances 8,355,756, being a number slightly greater than the whole population of Greater London. The significance of these figures is enhanced by admirably clear tables in both reports analysing the purpose of the beds allotted in each hospital and the purpose of out-patient attendances, giving full details of the numbers of medical and surgical staff, the percentage of beds occupied, and the average stay of the patient in them.

Most interesting because most novel is a geographical analysis showing for each hospital the numbers of patients coming to them from the various regions and boroughs of the county of London. The analysis is strikingly dissimilar in the two surveys. The general municipal hospitals are populated to a large and often preponderating extent by patients drawn from the borough in which they are situated. St. Giles', for instance, draws all except 6 of its 8511 in-patients from the borough of Camberwell; St. Charles' draws 2589 of its 3918 in-patients from the borough of St. Marylebone. Little more than 1 per cent. of the patients come from outside the county. On the other hand, some of the voluntary teaching hospitals draw quite a large proportion (in the case of Charing Cross more than half) of their in-patients from outside the county; and there is scarcely a borough in the whole of London which does not send an important contingent of patients to one or other of the 12 teaching hospitals. As was to be expected, the first choice of hospital in the case of each of the 30 metropolitan boroughs follows the path of least resistance.

In the north-western area Hammersmith, Fulham, and Chelsea choose St. George's; Kensington and Paddington choose St. Mary's; the City of Westminster chooses the Westminster Hospital. In the northern area Marylebone and Hampstead choose the Middlesex; St. Pancras chooses University College; Holborn and Islington choose the Royal Free; Finsbury and Shoreditch choose St. Bartholomew's. In the north-eastern area Stoke Newington, Hackney, Bethnal Green, Stepney, and Poplar choose the London Hospital; the City of London chooses St. Bartholomew's. In the south-eastern area Woolwich, Greenwich, Deptford, Bermondsey, and Southwark choose Guy's; Lewisham and Camberwell choose King's College. In the south-western area Lambeth, Battersea, and Wandsworth choose St. Thomas's.

But it must be added that in many cases the second choice was not so far behind the first, and in general the total number of patients going to other hospitals largely exceeds what we have called the first choice. Table C in fact is a striking example of how the hospital patient has maintained the voluntary system by an apparently arbitrary choice of hospital which he shall attend. This gigantic game of hospital halma is a fact to be reckoned with in any scheme of hospital reorganisation. The rules of the game are complex, but no doubt include the selection of cases for teaching purposes, the loyalty of practitioners to the school at which they were trained, and the prestige of well-known specialists.

By a happy coincidence the survey is made more complete by the reissue this week of a list [1] of "pay beds" now available in the London voluntary hospitals. This provision for the professional and middle classes is growing rapidly, the number of such beds known to King Edward's Fund on the last day of 1932 being 1667, compared with 590 in 1920. The list contains a description of the provision, whether in the form of single rooms, small wards for two or four persons, or cubicles, and a note of the normal weekly charge.

POST-OPERATIVE PULMONARY COMPLICATIONS

PULMONARY complications still rank among the commonest and most serious risks of major operations, especially those entailing an abdominal incision. If the broadest definition is adopted and a pulmonary complication is diagnosed in every patient who calls for a sputum-pot, it appears that bronchitis or some more serious condition occurs after well over half of all abdominal operations in men. In women, for some inscrutable reason, the incidence is notably lower. The type of anæsthetic chosen is thought to have little bearing on the problem and improvements in anæsthetic technique of the last few years do not seem to have improved matters. Unfortunately, too, there is no very general agreement about the pathogenesis. It is true that massive collapse of one or more lobes of the lungs is occasionally encountered; but there is no convincing evidence that minor degrees of this condition are at the root of the more common complications. As a rule the clinical picture is fairly clear-cut. Within 48 hours of the operation the patient develops a cough with tenacious mucopurulent sputum. In most cases the trouble goes no further, but in some the temperature and pulse begin to climb and more or less definite signs of consolidation appear at one or both bases. Clinically, then, the condition appears to be primarily one of basal broncho-pneumonia.

Among the many prophylactic and therapeutic measures which have been recommended, overbreathing, induced by administration of carbon dioxide mixtures, has enjoyed considerable popularity, largely owing to the enthusiastic advocacy of Yandell Henderson and H. W. Haggard. It is claimed that overbreathing removes the last traces of irritant anæsthetic vapour from the lungs and also corrects any tendency to focal atelectasis. These, however, are merely theoretical arguments; the proof of the pudding is in the eating. Controlled observations have up to the present been few, but a recent paper by D. S. King [2] is very much to the point. It is based on a series of 648 laparotomies in which hyperventilation was induced during the first three post-operative days, either by inhalation of mixtures containing carbon dioxide, or by rebreathing of expired air. Another series of 667 cases served as a control. Cases of simple bronchitis were ignored, but even so the incidence of lung complications approached 50 per cent. in operations on the stomach and duodenum and the gall-bladder.

[1] Post free 3*d*., from King Edward's Hospital Fund for London, 7, Walbrook, E.C.4.

[2] Jour. Amer. Med. Assoc., Jan. 7th, p. 21.

The most important fact emerging from the research is that complications occurred just as frequently in the treated cases as in the control series. This agrees with observations on a smaller number of cases made in this country, and it leads Dr. King to the disappointing conclusion that overbreathing does nothing to prevent post-operative lung complications. It is impossible to reconcile this failure with the hypothesis that collapse is the first and essential stage in post-operative pneumonia. It is not disputed that some degree of collapse is often present, for there is no doubt the aeration of the bases of the lung is defective after laparotomy and, as M. Printzmetal, S. Brill, and C. D. Leake [4] have recently shown, the intra-pleural pressure is actually increased. But collapse, if present, is of secondary importance. The available evidence suggests that the sequence of events is as follows. The patient returns from the operating theatre with a painful gash in his abdomen which effectually discourages him from *coughing*. Mucus then tends to accumulate in his bronchi and so the path is prepared for bronchitis and all its attendant dangers. No amount of *overbreathing* will remove this mucus. Indeed, it is probable that inspiration, being more efficient than expiration, will tend to suck the stagnant secretions still further into the bronchial tree. In its final analysis, then, the problem amounts to this: the patient develops bronchitis mainly because it hurts him to cough. His attendants can help him most, apart from avoiding tight binders and encouraging early movement, by pointing out to him the error of his ways.

A HABITATION FOR THE INSANE

EVERYBODY knows the kind of treatment that was meted out to the insane in the eighteenth century. In April, 1790, a Quaker named Hannah Mills died in York Asylum, and suspicions of the treatment she had received were aroused in the minds of York Friends. A practical idealist, William Tuke, turned his thoughts and energy to a scheme for providing for Friends "an habitation" where others afflicted like Hannah Mills might receive more tender care. At that time the lunatic was regarded as a person whose main, if not only, need was protection, and the story of The Retreat, told by its present steward,[5] is largely the story of the development of the conception of a mental home as a hospital. A home-like atmosphere has, however, always been maintained, and the process of hospitalisation has been that of building up a combination of club and hospital life, and not that of substituting for the home an institution run more by the head than by the heart.

The first patient was admitted on June 13th, 1796, and soon such modern methods as the warm bath and the liberal diet were in use. Drugs and medicine were found to be of little value. The treatment of a case of insomnia illustrates the simple and practical way in which the first superintendent, George Jepson (not a medical man), faced difficulties. He argued that animals seek repose after a full meal, and therefore caused a patient whose "violent excitement of mind indisposed him to sleep, to be supplied freely with meat or cheese, and bread and good porter." The result was satisfactory, and in subsequent cases where the patient was adverse to food, beer alone was used with great advantage, "always avoiding, in all cases, any degree of intoxication." Depite the attitude of the early Quakers to frivolity, some amusements were allowed even at this time; writing and reading, chess, draughts, and so on. Novels, however, were not allowed until the time of John Kitching, who was the second resident medical officer (1879–1884), and introduced many other amenities: lectures, botanical studies, a rocking boat, and a donkey. It was he who first advocated the villa system, which was adopted under the régime of his successor, Robert Barker. The plan of sending some of the patients to the seaside for a holiday was introduced by Thomas Allis, the superintendent (non-medical) from 1823–1841.

All these things are now commonplaces but they were startling innovations at the time, and only towards the end of the nineteenth century did The Retreat cease to be unique. It is difficult to realise now how much interest the experiment aroused. The Retreat always encouraged visitors, and from the beginning appointed three official varieties. In 1816 Dr. Duncan came from Dublin "for the purpose of visiting the most celebrated lunatic establishment in Great Britain." Elizabeth Fry came several times, and recorded in her diary in 1799: "We saw the Friends' Retreat for crazy people, which my father thought extravagantly carried on."

The story of The Retreat was well worth the telling. It has been set forth in an attractive format, and in lucid prose full of quiet humour. A foreword was contributed by Dr. Bedford Pierce, the greater part of whose long and fruitful life was devoted to the hospital, and to whom the book forms an apt memorial. At its close is a note by the superintendent, Dr. Neil Macleod, forecasting the future of mental treatment in general and of The Retreat in particular. The book is illustrated by photographs of the worthy men and women who have played their part in building up the institution, and the whole forms an inspiring record.

THE MECHANISM OF DYSPNŒA IN HEART FAILURE

OBSERVATIONS have been made by T. R. Harrison and collaborators [1] on the cause of dyspnœa produced by mild exercise in cases of heart disease. They assert that an adequate explanation of such patients' dyspnœa has not yet been offered, and object to the one based on lowered circulation-rate on the ground that neither in arterial nor venous blood have the altered hydrogen-ion concentration, carbon dioxide content and pressure, and oxygen content postulated by this view been demonstrated. The cause of this dyspnœa experienced on mild exercise was therefore sought elsewhere. The subjective symptom of respiratory distress—that is dyspnœa—was found to be proportional to the ratio of ventilation to vital capacity. Thus dyspnœa tends to appear with increased ventilation or with reduced vital capacity. The latter is common in heart disease. Experimental work on dogs showed that reduction of the vital capacity, using various methods, led to a reflex increase in breathing, the afferent path being through the vagus. No further reduction in vital capacity was noted on exertion, so it evidently plays no part in the production of dyspnœa on mild exertion, and the cause must be looked for in changes in ventilation. Observations on ventilation made on normal men and on dogs strongly suggested that the increase produced by limited muscular movements was due to nerve

[4] Surg., Gyn., and Obst., Jan. 1933, p. 129.

[5] A Retired Habitation. By Harold Capper-Hunt, Steward of The Retreat. London: H. K. Lewis and Co., Ltd. 1932. Pp. 144. 7*s*. 6*d*.

[1] Arch. Internal Med., 1932, l., 690.

impulses from the moving muscles. Further experiments on animals demonstrated increased ventilation as a result of increasing the pressure in the right auricle, provided the vagus was intact. In cardiac disease the venous pressure is very often higher at rest than in normal persons, and undergoes a greater rise on exertion. The results of the author's investigations lead them to the conclusion that the cardiac patient experiences dyspnœa on mild exertion through a threefold mechanism: diminished vital capacity, afferent impulses from the moving muscles, and increased venous pressure in the right side of the heart. The second factor is in operation in the normal person, and only the first and last are peculiar to the cardiac patient. But the conclusion that the data presented are evidence against "the widely accepted but erroneous theory that the symptoms of cardiac failure are essentially and primarily due to a diminution in the minute output of the heart," does not seem to be sound. For increased venous pressure is after all generally accepted as indicating a diminished capacity for work on the part of the heart, while diminished vital capacity in heart disease is itself attributed to venous engorgement of the lungs.

PER-URETHRAL OPERATIONS ON THE PROSTATE

THE key to success in per-urethral operations is the proper selection of cases. Dr. T. J. Kirwin,[1] whose paper is conspicuous for its restrained judgment on this controversial subject, believes that the per-urethral approach is suitable for the following types of obstruction: contracted bladder neck, median bar obstruction, enlargement of the middle lobe of the prostate with slight lateral lobe hypertrophy, subcervical gland hypertrophy, carcinoma of the prostate, congenital urethral valves, slight lateral lobe hypertrophy, and cases of obstruction where, for some reason or other, total prostatectomy is contra-indicated. Outside these bounds, he says, the surgeon is likely to meet with difficulty from hæmorrhage both during and after the operation; moreover, the results are uncertain, and when a long time is spent in removing masses of tissue so great a strain may be thrown on the patient that his life is endangered. In discussing technique, Kirwin is emphatic about the advantage of a current of low amperage. If high-amperage currents are employed the effects of the heat generated are felt far beyond the area actually resected. Fluid in the tissues is converted into steam which scalds and otherwise damages the surrounding bladder neck, and this damage may be followed by sloughing, cicatrisation, and eventually contraction of the tissues. Unfortunate sequelæ of this kind are obviated by the employment of radiothermy of low amperage. The instrument he uses is one of his own device. It has an outer sheath of bakelite, and the resection is done by means of a wire electrode which rotates across a large window in the ventral aspect of the outer sheath. This electrode rotates along a circumference corresponding to a 32 French catheter, the calibre of the instrument itself being only 28. By this means a sheath can be used of several sizes smaller than would otherwise be possible for obtaining so large a cut.

Besides laying stress on the need for care in the selection of cases he draws special attention to the importance of adequate pre-operative measures. If per-urethral resection is regarded as minor surgery, disaster is likely to follow. Post-operative drainage is secured by the introduction of a whistle-tipped catheter large enough to exert pressure on the walls of the posterior urethra and diminish post-operative oozing. Employing this technique, Kirwin has had 3 deaths in a series of 70 cases; the first patient dying of cerebral hæmorrhage, the second of myocarditis, and the third of peritonitis. Post-mortem examination of the last of these fatal cases showed a rent in the posterior urethra.

[1] Amer. Jour. Surg., January, 1933, p. 1.

THE PROGNOSIS FOR FRACTURES OF THE VERTEBRÆ

THE fate of 304 insured persons whose fracture of the vertebral column was notified in the ten-year period 1918–27 has recently been analysed by Prof. J. Åkerman,[1] chief medical officer of the Swedish Government insurance bureau, which deals with about 75,000 accidents every year. His analysis ignores partial fractures of the axis, the apophyses, the sacrum, and accidents complicated by fractures of the skull, pelvis, large bones of the limbs, or by lesions of the internal organs, and the cases in which death followed so quickly that there was no time to examine or treat the patients are also excluded. All the patients, of whom 274 were men, were treated in public hospitals, and the diagnosis was verified by repeated X ray examinations. The cervical vertebræ were involved in 68 cases, the dorsal in 102, and the lumbar in 134. The fatal cases numbered 68. The total mortality was 22 per cent., divided as follows: lumbar region 12 per cent., dorsal region 22 per cent., and cervical region 44 per cent. In 112 patients a recovery was effected without a degree of invalidism exceeding 10 per cent. In all the cases terminating fatally taken together, the average duration of life after the accident was 43 days, and in cases of fracture in the cervical region it was ten days. These averages are vitiated by a few cases in which the patients survived for several months; most of the patients who died did so after only two or three days. The difference between the temporary compensation and the permanent compensation finally allowed was only about 10 per cent.—a finding which shows that there is not much to be hoped for in the way of late recoveries.

LONGEVITY AFTER CORONARY THROMBOSIS

TWENTY years ago myocardial infarction from coronary obstruction was held to be of interest only to the pathologist; clinically it received attention merely as a cause of sudden death. Since the war, however, it has become generally recognised that acute coronary obstruction has a well-defined clinical picture; and now that it can be diagnosed during life we have learnt that it is by no means always fatal. A good example is a case just reported by Dr. Paul D. White,[2] in which a man had a typical attack at the age of 63. He made a perfect recovery, and two years later was passed for life insurance despite a very careful examination of his heart. At the age of 72 he did a great deal of mountain climbing, and his average time for a climb of 3000 feet over a distance of five miles was two hours and a quarter. Eleven years after the attack he began to suffer anginal pain on exertion. By modifying his life and living at a lower level he progressed well until, at the age of 80, he died in a few days from a cerebral hæmorrhage. Post-mortem examination revealed an old occlusion of a branch of the right coronary artery

[1] Acta Chirurgica Scandinavica, vol. lxxi., Fasc. i.–vi.
[2] Jour. Amer. Med. Assoc., Jan. 28th, p. 233.

and a fibrous scar at the base of the left ventricle posteriorly. White also has under observation a patient, aged 67, who had his original attack of coronary thrombosis 20 years ago, and has survived two further attacks. At present he is still leading an active life as a minister of religion, with little restriction on his movements. Such cases show that myocardial infarction may be followed by complete and lasting functional recovery, and the paper by the late Dr. Carey Coombs, reviewed in our issue of Jan. 28th (p. 209), provided numerical evidence that a fair proportion of patients survive their first attack.

EXERCISE AND DIGESTION

IT is a pleasant and, occasionally, a profitable pastime to review old tags and proverbs by the light of modern knowledge. For example, we are exhorted to rest awhile after dinner, but after supper to walk a mile, and, superficially, there seems to be no foundation for a different ritual attending the two meals. Is the assumption that midday dinner is the more substantial meal and so calls for a rest which is less necessary after supper? Or may an arbitrary distortion be employed and the conclusion be accepted that after both dinner and supper rest is advisable followed after an interval by walking exercise? Natural inclinations go for something, and the lethargy and disinclination for activity following a full meal are certainly safeguards against syncope due to the pressure of a distended stomach upon a rapidly beating dilated heart. On the other hand, it is a matter of common observation that the digestion of a comparatively light meal may be assisted by gentle exercise, and scientific support for this experience is provided by the fractional test-meal and by radioscopy. Campbell, Mitchell, and Powell [1] found that in normal healthy young men moderately severe exercise, such as running at the rate of eight miles an hour, delayed the digestion of a recently ingested light meal; but that gastric secretion was not inhibited, and the rate at which the stomach emptied itself was increased by easy walking, especially in company and with conversation—concomitant factors which seemed to show the importance of psychological influence, an influence which is too well recognised to require elaboration.

The latest investigators in this field, F. A. Hellebrandt and M. M. Miles,[2] of the University of Wisconsin, confirm the impression that gentle exercise before or after a test-meal encourages and augments gastric acidity. The duration of exercise is not necessarily in itself, they find, an adverse factor; but the element of exhaustion, whether before or after the meal, is definitely inimical to secretion. To ensure exhaustion rapid bicycle riding and rope jumping were employed; whilst in further researches to introduce the element of competition with the inevitable psychical accompaniments they enlisted the coöperation of basket-ball players—young women—in a contest of spirited rivalry. Moderate or mild muscular exertion increases general metabolism, improves the circulation, and has a stimulating effect upon the organism as a whole, the stomach naturally participating in the general increase of functional activity. Exercise carried on at high speeds incurs an oxygen debt and the rapid accumulation of acid metabolites—in a word, exhaustion, or at least fatigue. The accumulation of lactic acid in the blood lowers its bicarbonate content and accelerates the output of carbon dioxide. The lungs cannot wash out the carbon dioxide sufficiently rapidly and the hydrogen-ion concentration rises. In the light of experimental observations the reduction in gastric acidity as a result of violent exercise may be due to the concomitant fall in plasma-bicarbonate. Hypo-acidity then appears when muscular exertion is associated with the incurring of an oxygen debt. Further, during severe exercise, splanchnic vaso-constriction diverts blood from the viscera to the actively contracting limb muscles and to the skin, producing a relative diminution of oxygen to the stomach which again will reduce gastric acidity. Confirmation of these chemical tests is forthcoming on the radiographic side. From the physiological laboratory of Guy's Hospital, T. W. Adams, D. J. Clarke, J. M. Lees, M. S. Pembrey, and R. S. Vine [3] submit the results of experiments to show the influence of muscular work upon the movements of the stomach. The meal employed consisted of ¼ lb. cold pressed beef, two rolls, two pats of butter, ½ oz. bovril, and 6 oz. barium sulphate minced together and made into a stiff paste with water. Radiographic observations followed on hard muscular work, such as running a mile in eight minutes or swimming 450 yards in 13 minutes in a bath at a temperature of 60·8° F. They found that such exercise is associated with relaxation of the stomach and delay in passage of the food, and that even if the work is started at a longer interval after the meal, a definite inhibition of the movements is produced.

It has been the experience of radiographers that moderate and natural exercise helps the stomach to empty, and it is often their practice to advise patients under investigation to go for a walk after their first examination of an opaque meal, before subsequent examinations, to reproduce physiological processes at their optimum. Finally, in connexion with the relationship of exercise to digestion, the subject of stitch is pertinent. This phenomenon described in these columns [4] as an acute physiological visceroptosis, is a painful sensation arising from strain upon the coronary and other peritoneal ligaments, produced by the weight of the heaviest viscera in the erect attitude. And although jerkiness and vibration and motor irregularities of all kinds are the prime determining factors, anything which contributes to the weight of a viscus will be an additional factor of importance. It is not surprising, therefore, that stitch is likely to come on when exercise follows soon after a heavy meal.

NON-TOXICITY OF FORMOL-TOXOID

FORMOL-TOXOID, the anatoxin of Ramon, is prepared by digesting diphtheria toxin with formaldehyde. The resulting product, whilst completely or almost completely non-toxic, retains unimpaired the antigenic value of toxin. Anatoxin, the preparation generally used for prophylaxis on the continent and in Canada, is injected subcutaneously in doses which range from 0·5 to 1·5 c.cm. That it is devoid of toxicity even if injected by inadvertence in massive doses appears to be conclusively shown by an experience recorded by E. Aubertin and P. Boudou.[5]

A young workman contracted faucial diphtheria of moderate severity. The clinical diagnosis was confirmed bacteriologically by the Pasteur Institute at Bordeaux, and the practitioner decided to inject diphtheria antitoxin. A neighbouring chemist was asked for a supply, but found that he was out of stock. Remembering, however, that he had some 10 c.cm. ampoules of anatoxin intended for the immunisation of children in the town, he sent a number of

[1] Guy's Hosp. Rep., 1928, lxxviii., 279.
[2] Amer. Jour. Physiol., 1932, cii., 258.
[3] Brit. Jour. Radiol., December, 1932, p. 869.
[4] THE LANCET, 1932, i., 1209.
[5] Paris Méd., Nov. 12th, 1932, p. 393.

these instead, thinking that they would answer the purpose equally well. The unsuspecting practitioner injected subcutaneously a first dose of 100 c.cm. of what he believed to be antitoxin, and on the following day a further 50 c.cm. It was only when casually examining the labels of some of the remaining unopened ampoules that the mistake was discovered. After the first dose the patient complained of slight local pain in the abdomen, the site of injection. This was quickly succeeded by signs and symptoms of severe shock; pallor and drawn features, irregular and uncountable pulse, dilatation of the pupils, and abdominal pain. The shock was of short duration, but the patient remained in an exhausted condition for the rest of the day. In the evening there was some rise of temperature and some spread of the membrane. The patient had a restless night, but next morning was very much better. The membrane had almost entirely disappeared, the pulse was good, and the temperature barely above normal. He had passed a litre of urine free from albumin. Although satisfied with the progress of the case, the doctor determined upon a second injection. This immediately produced shock which was, however, far less severe than that of the preceding day. The following morning the last remaining traces of membrane were readily detached, and the general condition of the patient was very satisfactory. At the site of the first injection an area of œdema and redness with a radius of 10 cm. was noted. The patient made an uninterrupted recovery.

Aubertin and Boudou emphasise this history as evidence of the non-toxicity of anatoxin. They note that the reactions to which its injection in prophylactic doses on occasion gives rise are allergic in nature, and clearly in the case described the shock from which the patient suffered was allergic. They point out that in diphtheria, at any rate, allergy and immunity are two separate processes which may coexist. Although the former is often manifest earlier than the latter, there is no evidence that it prepares the way. Some have held that the abortive, *formes frustes* of the disease are allergic in character, but Aubertin and Boudou think rather that they are to be explained as the beginnings of immunity. (Whether the abortive attack occurs in a subject who is completely non-immune or who has, as is more probable, a certain degree of basal immunity, there is certainly an antigenic response and a step, at least, towards immunity is thereby taken.) A. T. Glenny [*] has shown that the antigenic response to diphtheria and other toxins varies greatly according to whether the stimulus is primary or secondary. After primary injection of toxin into an animal no antitoxin can be demonstrated for three weeks, but if then a second injection is made, the antigenic response is not only much quicker but much greater. The latent period is reduced to three days, at the end of which the antitoxin curve rises steeply. It would seem that in the present case, the large dose of anatoxin in addition to causing allergic shock had the effect of a secondary stimulus. As a result, the patient's antitoxic titre increased rapidly and effected his clinical cure. Although Aubertin and Boudou do not allude to the important work of Glenny, they suggest the same process in other terms and consider that it might be of interest to inject anatoxin in cases of diphtheria with or without concomitant antitoxin therapy.

This claim that anatoxin can do no harm was made before the accident which followed its employment at Bourbon Lancy, near Charolles (Saône et Loire) just before Christmas and attracted much public attention. The facts, as given by the French Ministry of Health on Jan. 28th, are these. A child who had been vaccinated with diphtheria anatoxin supplied by the Pasteur Institute had died, and seven others had been ill, but had recovered. Since the anatoxin used was part of a large batch, and no other mischances had been reported, the Ministry presumed that the accident was due to lack of necessary precautions. It appears that the child who died had previously been in indifferent health; the seven others had signs of severe infection at the site of injection in the thigh, which for some reason had been selected instead of the usual site at the back of the arm or shoulder. None of the other children in the village who had been vaccinated with the same material by other medical men had shown similar symptoms. The further inquiry which is in progress should clear up any doubt.

[*] Jour. of Hyg., 1924, xxiv., 301.

CHILDREN AND THE ECONOMIC DEPRESSION

QUESTIONS in Parliament have elicited replies from the Minister of Health and the President of the Board of Education that the effect of the economic depression on the health of school-children is being carefully watched, and that special inquiry on the lines of the League of Nations' memorandum is unnecessary. Both State departments pointed to the information available from official and other sources, amongst which is the report presented to the L.C.C. education committee on an inquiry conducted last December into the nutrition of children in a poor part of the East End of London. Nine families were selected for investigation by experienced social workers, the number of children being 25, none of them being fed at school. Although the nutrition of seven was found to be below the average, in no case did this appear to be due to general lack of nourishment; rather was it associated with illness. This committee is arranging for similar inquiries to be carried out in other districts of London, to be the subject of a fuller report later. A more extensive inquiry into the effect of unemployment on children in distressed areas is being organised by the Save the Children International Union, the results of which should be available by the end of May. In the meantime no doubt some of the reports of medical officers of health and school medical officers for the year 1932 will have appeared. Information is now available for Glasgow in a report on the education health service for the year ended July 31st, 1932; this contains a paragraph stating that no evidence of deterioration has been observed in the nutrition of the school-children as judged by average heights and weights, although rickets of a minor degree had shown a tendency to increase among the pre-school population. Other areas seem to have noted a similar increase of rickets in young children. The cold spell of the last few weeks will have thrown a greater strain on small household budgets, and is likely to make more manifest the under-nourishment present in children who are ill-clad and therefore likely to suffer from the cold. It may be, as Dr. F. L. Keith has satisfied himself for Deptford, that the mothers are increasingly starving themselves for the benefit of the children, and those public assistance committees are to be commended which make the feeding of school-children supplementary to transitional benefit rather than part of it. We find it disquieting to learn from the Parliamentary Secretary to the Board of Education that the number of free milk meals provided in Lancashire fell from 199,000 in November to 145,000 in January.

INDEX TO "THE LANCET," VOL. II., 1932

THE Index and Title-page to Vol. II., 1932, which was completed with the issue of Dec. 31st, is now ready. A copy will be sent gratis to subscribers on receipt of a post-card addressed to the Manager of THE LANCET, 7, Adam-street, Adelphi, London, W.C.2. Subscribers who have not already indicated their desire to receive Indexes regularly as published should do so now.

SPECIAL ARTICLES

THE EFFECT OF PASTEURISATION UPON THE NUTRITIVE PROPERTIES OF MILK

By William G. Savage, M.D. Lond., B.Sc., D.P.H.
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Since milk is chemically very complex it can hardly be anticipated that heat will be without any effect upon its composition. The practical question is whether any changes result which affect the nutritive qualities of cow's milk as a food for man.

The expression "pasteurisation" is often employed without exact definition and not always in reference to the same heat action. In this paper, unless otherwise stated, it is used as the official definition of the Ministry of Health. This involves heating the milk to 145° F. and holding it between 145° F. and 150° F. for 30 minutes, after which the milk is rapidly cooled.

Changes Produced by Pasteurisation

A good deal of confusion in the past has been caused by writers discussing, without any clear distinction, changes produced at various temperatures, including the boiling of milk, and not merely changes induced by pasteurisation. These contributions have to be excluded unless they include results obtained at pasteurisation temperatures. Only the latter are here under consideration.

No changes have been reported in the fat, apart from slight physical alterations which may cause the cream to rise less readily. The milk proteins are not altered, apart from the fact that a very small proportion (round about 5 per cent.) of the lactalbumin becomes insoluble, but there is no evidence that it is rendered less digestible. The lactose is not affected. The only constituents round which discussion centres, and which have to be considered, are the mineral constituents, the enzymes, and the vitamins.

MINERAL CONSTITUENTS

Bell (1925),[1] using the method of filtration under pressure through a Pasteur-Chamberland filter, obtained very small losses of diffusible calcium and of phosphorus, but not beyond the limit of experimental error. Much greater variations were found when the milk was centrifugalised. Magee and Harvey (1926)[2] found that about 26 per cent. of the total calcium oxide is in the diffusible or soluble form in fresh milk, pasteurisation (65° C. for 30 minutes) reduces this to about 20 per cent. The losses in soluble calcium were believed to be due to the formation of a colloidal form of calcium phosphate. Mattick and Hallett (1929)[3] found that at 145–150° F. the amount of the total calcium which becomes indiffusible is about 2 per cent., while the evidence of any change at pasteurisation temperatures in diffusible phosphorus is inconclusive. Their tables show that the total calcium is not reduced, and that only 25 per cent. of the calcium is in a diffusible form. The reduction in the percentage of diffusible calcium is 9·5 per cent. Bell's figure for diffusible calcium was 23·8 per cent. (as CaO), while Magee and Harvey quote Rona and Michallis 44 per cent. (CaO) and Grosser 23·4 per cent.

These results suggest that only about 25 per cent. of the calcium of cow's milk is present in a diffusible form, and that the effect of pasteurisation is to slightly alter this proportion by reducing the diffusible fraction by about 6 per cent., estimated as CaO. There is no evidence from these reports that this calcium is lost or that this small change in the diffusible proportion affects the availability of the calcium, but this point is discussed in the section on animal experiments. Magee and Glennie (1928)[4] estimated the iodine in 135 samples of fresh milk, and these showed considerable variations from 4·2 to 7·46 γ per 100 c.cm., the average being 5·69. With pasteurised milk the variations were from 3·68 to 5·90, the average being 4·51. These figures show an average loss of 20 per cent. This was evidently due to volatisation. Unfortunately no information is given either as to the pasteurisation temperatures or as to the method of pasteurisation—i.e., if open or closed. Approximately 83 per cent. of the total iodine of separated cow's milk was found to be in diffusible form.

ENZYMES

Most of the numerous investigations deal with temperatures above those of pasteurisation, and their general tendency is to show that at 150° F. they are not destroyed. Peroxidase is definitely not destroyed (Zilva and others). Mattick and Hallett[3] found that milk heated to pasteurisation temperature showed delay in the time of coagulation to rennet, a point of interest for cheese-making but of no significance from the human nutritive aspect.

Allen (1932),[5] in his valuable survey, points out "very few accurate data appear to be available on the effect of heat on the enzymes of milk, so that it is impossible to say in most instances to what extent pasteurisation may induce inactivity." In any event, the point would appear to be purely of academic interest as there seems to be no evidence that their presence is of any importance in human feeding. (For a review of this question see Lane-Claypon, 1916.[6])

VITAMINS

While milk contains all the vitamins they are very unequally present in it. Vitamin A is abundant in milk and is not affected by the temperature of pasteurisation. The amount of vitamins B_1 and B_2 in milk vary, being affected by the food of the cow. B_2 is particularly heat stable, but B_1 also possesses considerable resistance to heat. The report on vitamins[7] published by the Medical Research Council last year remarks: "There is general agreement that the resistance of vitamin B_1 to heat in faintly acid or acid media is considerable. Most observers have detected little or no destruction of the vitamin after exposure to 100° C." Even with milk heated for some time at high temperatures, round about 100° C., such as evaporated milk, the work of Samuels and Koch (1932)[8] shows that only about one-sixth to one-fifth of the antineuritic heat-labile fraction (B_1) is destroyed. At pasteurisation temperatures there is no evidence of any destruction.

Vitamin D is very variable in milk, and under certain conditions of diet and feeding there may be very little in milk. There is no evidence that it is affected by pasteurisation.

Vitamin E is present in milk, and the Medical Research Council report remarks: "Vitamin E appears to be remarkably stable to heat, resembling in this respect vitamin A."

Vitamin C is the least heat stable of the known vitamins. The earlier reports suggest that most of this vitamin is destroyed at a low temperature, but, as with other vitamin heat studies—i.e., as regards canned foods—further investigations show that this extreme view must be modified. Schwartze, Murphy,

and Hann (1929–30) [9] found that by lightly boiling 3 quarts of milk for five minutes, after being brought to the boil in about 20–27 minutes in a glass beaker or in an aluminium pan, only 20 per cent. of the vitamin C was destroyed. This is a severer temperature test than pasteurisation.

Schwartze, Murphy, and Cox (1931) [10] deal with pasteurisation temperatures, and studied the influence of aluminium, tinned copper, and copper upon vitamin C content. With aluminium vessels and full aerobic pasteurisation the destruction of vitamin C was 20 to 40 per cent., with tinned copper slightly greater, but in naked copper it was at least 80 to 90 per cent. With anaerobic pasteurisation with the first two compounds they consider the vitamin destruction would be greatly reduced.

It must be accepted that there is some destruction of vitamin C by pasteurisation, but from the practical point of view this is of but little importance, since cow's milk is such a bad source of this vitamin that it ought to be supplemented in any case—i.e., if raw or pasteurised milk is the sole food-supply. As the Medical Research Council report states :

> "Milk is a variable and by no means rich source of the antiscorbutic vitamin. As much as 100 c.c. of some samples of fresh raw cow's milk daily and more may be required if scurvy in guinea-pigs is to be prevented by its agency alone, while as little as 20 c.c. of a summer pasture milk has been found to afford protection."

When these changes are all set down the essential fact which emerges is their comparative insignificance. What they amount to is that the already large proportion of insoluble calcium is increased by about 6 per cent., and possibly there is a similar change in the proportion of insoluble phosphorus. The very small and variable amount of iodine may be reduced by 20 per cent. There is some reduction of vitamin C. There is no evidence of any other significant changes. It may also be pointed out that these changes are much less than the natural variations which occur in different samples of cow's milk. If we are to attach the importance which some would have us do to these slight changes which result from pasteurisation, it is evident that the agricultural interests will have to accept the view that milk to be of value to man must be from cows so fed and treated that their vitamin content is up to standard and that other constituents cannot be neglected.

Comparison of Human and Cow's Milk

It is now evident that while the changes which result when milk is pasteurised are comparatively unimportant some changes do occur. It is important to realise that because there are changes they are not of necessity detrimental changes and damage the nutritive value of the milk for man, an assertion so often made. If we were dealing with the value of milk for the calf it is reasonable to assume that any physical agency which alters in any way the composition of cow's milk is likely to be detrimental to the calf. When, however, it is a question of the value of cow's milk as a food for an entirely different species with widely different metabolic requirements to make such an assumption is entirely unscientific. It may be the case that these changes which result from pasteurisation are wholly or partially beneficial in that they make an alien food rather less unsuitable than it otherwise would be as a food for another species. To assess the significance of any changes shown to occur it is essential to compare raw cow's milk, pasteurised milk, and human milk, both as regards their chemical composition and as regards their suitability as foods for the human species.

In making such a comparison we have to bear in mind the fact that both human and cow's milk vary widely in composition under the influence of different conditions. These differences cannot therefore be conveniently set out in tabular form. It is only necessary to consider in detail those constituents which are affected by pasteurisation.

Average human milk is rather poorer in fat than cow's milk, while there is no evidence of important quantitative differences. Lactose is more abundant in human milk. Since these constituents are not affected by pasteurisation they do not require further discussion.

The proteins show wide differences. In cow's milk caseinogen is approximately 3 per cent., lactalbumin about 0·5 per cent., and lactoglobulin about 0·05 per cent. In human milk the caseinogen is about 1 per cent., and lactalbumin about 0·5 per cent. or rather higher, but various figures are given by different authors. Lactalbumin is richer than caseinogen in the two amino-acids, cystine and lysine, both specially important for growth.

The quantity of ash is about three times as high in cow's milk as in human. The mineral constituents of cow's milk have recently been exhaustively reviewed by Allen (1931), but only some of them need to be discussed. Allen shows that there are considerable differences between individual cows in the calcium and magnesium content of the milk, both as regards the total quantities present and also for those portions present in true solution. Taking average figures, calcium varies from about 0·17 to 0·19 per cent. as CaO, phosphorus from 0·21 to 0·25 per cent. as P_2O_5. The stage of lactation has a definite influence. In human milk there are also considerable fluctuations. Lane-Claypon [6] gives many figures with averages about 0·04 per cent. CaO and 0·04 per cent. P_2O_5.

Telfer (1930) [11] finds the following figures for human milk CaO 0·045, MgO 0·006, P_2O_5 0·048, Fe 0·0001, and in cow's milk CaO 0·16, MgO 0·018, P_2O_5 0·21, Fe 0·00008 g. per cent. The concentration of these minerals showed no appreciable variations at different lactation periods.

Golding, Mackintosh, and Mattick (1932) [12] studied the milk of a typical herd of shorthorn cows over a period of three years. During 1928–29 the highest and lowest percentages of calcium were 0·136 and 0·122, with an average value of 0·127. For 1929–30 the figures varied between 0·140 and 0·115, the average being 0·124. For 1930–31 the figures varied between 0·141 and 0·124, the average being 0·131.

Of other mineral constituents iron is of importance, and Allen remarks "the quantity of iron in cow's milk is approximately one-quarter of that in human milk, and it appears to be independent of the nature of the feed." Davies (1931) [13] found that in fresh cow's milk the iron content ranged from 1·50 to 2·40 parts per million. In ten samples of pasteurised milk it ranged from 1·7 to 3·8 parts per million.

Vitamin A is abundant in both human and cow's milk. The B vitamins are usually adequate in amount in both milks, but in the Medical Research Council Report [7] the authors quote results from Detroit dealing with the amount of human milk required to prevent anti-vitamin symptoms in rats, and state "these results give an indication that human milk may easily be poor in vitamin D and in the B-vitamins. In point of fact there is good evidence that infants at the breast may in some cases suffer from lack of these vitamins." According to Outhouse, Macy, and Brekke (1928),[14] the ratio of calcium to phosphorus is a factor in rats as well as lack of

vitamin D. It has already been mentioned that vitamin D may be deficient or almost absent in cow's milk, and a deficiency may occur in human milk, since rickets is common amongst breast-fed babies.

As regards vitamin C human milk is probably a better source than cow's milk, but there is evidence that this vitamin may also be deficient in human milk.

When we utilise these facts to study the significance of the changes caused by pasteurisation, it is evident that, apart from vitamin C, they are in the direction of making cow's milk a little less unlike human milk. The diminution of diffusible calcium and phosphorus, of which so much is made, may be considered beneficial, at least for infant feeding, in that it does slightly reduce the gross excess of calcium and phosphorus available in cow's milk. Iron is markedly deficient in cow's milk and is not diminished in pasteurisation, but likely to be increased from contact with that metal. Vitamin C is often deficient in raw milk, so in feeding with cow's milk that has to be supplied from other sources, whether raw or pasteurised milk is used.

Animal Feeding Experiments

It will be simplest to describe the experimental work and then discuss its validity as applied to man.

A good deal of animal experimental work has been carried out using *boiled* milk, and the results have then been quoted as applicable to pasteurised milk. Since the changes which result from boiling are definitely more considerable this is unscientific, and here only results are considered which deal with milk subjected to pasteurisation temperatures.

ON RATS

Daniels and Loughlin (1920)[15] carried out rat-feeding experiments with five groups of treated milks—i.e., milk brought quickly to the boil and boiled one minute, milk brought slowly to the boil (35 minutes), milk pasteurised in bottles but usually at higher temperatures than in standard pasteurisation, unsweetened evaporated milk, and sweetened condensed milk. No controls with raw milk were used. The results show that when milk is fed after prolonged heating rats did not make satisfactory growth gains and fewer young were born. When a soluble calcium salt was added the rats made normal growth. As the authors point out all their results show is that there is some loss of available calcium on prolonged heating which varies with the conditions of heating, and that this loss affects the nutrition of rats.

TABLE I

Rats.	Milk treatment.	Total weights (g.)		Average gain in g. per rat.	Litters.	Pups.	Alive.	Weaned.
		Onset.	At mating (118 days).					
6 bucks	Raw	488	1538	175	6	47	41	18*
6 does	,,	430	1106	113				
6 bucks	Pasteurised	480	1412	155	6	42	22	7†
		431	1100	111·5				

* From four litters. † From one litter only.

Mattick and Golding (1931).[16] The greater part of their paper deals with sterilised milk and does not affect the problem under consideration. Their pasteurisation work merely deals with 12 rats and 12 control rats. All 24 rats were fed on biscuit and as much milk as they would take. One-half received the milk raw, the other after pasteurisation at 145°–149° F. for 30 minutes. The results are shown in Table I. The weight differences are not marked for the bucks and negligible for the does. The points in regard to young rearing are considered below. The milk consumed was not known, and we do not know if the pasteurised milk was imbibed as freely or not as the raw milk. No confirmation of these findings has been forthcoming.

Scott and Erf (1932).[17] Most of the experiments of these authors were a comparison of rats fed with milk from cows fed on specially selected foods containing numerous added minerals, with rats fed on pasteurised milk, shop purchased and of unknown composition and source. As a United States committee (1931)[18] points out, these are worthless from the pasteurisation point of view. They merely suggest that superior milk is more nutritive than poor quality milk, which we already know.

In only a very few experiments is the same milk, raw and pasteurised, fed to rats. In one group of experiments the authors state that milk from cows fed on a special diet was divided into two portions, one fed raw, one after heating at 62° C. for 30 minutes. The number of rats fed is not stated, the duration of the experiment is not mentioned, and no details are given other than to state that the rats fed with the heated portion showed a loss of 21 g. in weight, loss of 6 per cent. hæmoglobin, with a decrease of 1,200,000 red blood corpuscles. Whether the controls gained or lost weight is not mentioned. As quoted, this experiment is valueless.

From another group of experiments with five series of rats, six in each group, fed in different ways it is possible to extract the following particulars. One group of six rats were fed with raw milk, while another six rats were fed with the same milk after heating to 145° F. for 30 minutes. The experiment extended over 11 weeks. The raw milk group gained 100 g. in weight and 2,340,000 red blood corpuscles, the pasteurised milk group gained 66·5 g. and lost 2,300,000 red blood-cells. It is not clear if the figures refer to the bulked six rats or is an average for each rat. It may be mentioned that the pasteurised group did better than two other groups which were fed with unheated milks from other sources.

It will be noted that merely six rats were included in the experiment and the records are so incomplete that very little of any significance can be deduced.

ON PIGS

Orr, Crichton, Crichton, Haldane, and Middleton (1926).[19] Growing pigs were fed on a ration of cereals to which was added either fresh milk, pasteurised milk, or sour milk. The addition to the ration of fresh milk caused the rate of absorption of calcium, phosphorus, and nitrogen to rise rapidly, but this was somewhat depressed when pasteurised was substituted for fresh milk, to rise again when sour whole milk took the place of pasteurised milk. This was shown to be due to the decrease in soluble calcium, since when soluble calcium was added equal to double the amount of soluble calcium lost in pasteurisation a greater retention of calcium, phosphorus, and nitrogen was obtained than when fresh milk alone was added. The increase in the retention of calcium was greater than the amount of soluble calcium added.

Magee and Harvey (1926).[20] Their results are interesting as showing the unsuitability of cow's milk for the young pig. Cow's milk contains on an average 0·16 per cent. CaO, and 0·24 per cent. P_2O_5 with a ratio of 1 : 1·5, whereas sow's milk contains 0·39 per cent. CaO and 0·36 per cent. P_2O_5, a ratio of 1 : 0·92. A young pig on a diet of cow's milk and cereals showed signs of rickets after 30

days. The addition of a soluble calcium salt to the diet of cereals enabled the animals fed on it to remain in a thriving condition for 60 days. Under experimental conditions the retention of calcium, phosphorus, and nitrogen was lower with heated milk than with either fresh or sour milk. On the other hand, the addition of calcium chloride to the pasteurised milk caused an increase in the amount of calcium retained which was more than twice the amount added, so that the calcium retention was greater than when fresh or sour milk was given.

ON CALVES

Orr, Crichton, Crichton, Haldane, and Middleton (1926)[19] carried out a series of feeding experiments with calves. The pasteurised milk was from the same source as the raw but pasteurised in one experiment by the "flash" method and in two by the "holder" procedure. They found a lessened increase of weight with pasteurised as compared with fresh milk, but this could be entirely obviated by the addition of calcium lactate to the pasteurised milk. All the calves receiving either fresh milk or pasteurised milk plus the soluble calcium salt remained in perfect health. Those receiving pasteurised milk were not in such good condition as the others, while in one experiment the animals showed definite signs of malnutrition.

ON GUINEA-PIGS

Schroeder (1913)[21] used 467 guinea-pigs, removed from their mothers immediately after they were born and divided into three groups.

Group 1.—155 guinea-pigs fed raw milk.
„ 2.—156 „ „ pasteurised milk.
„ 3.—156 „ „ boiled milk.

The pasteurisation temperature was 60° C. for 20 minutes. The experiment extended over a period of ten months. Weight and mortality were the two signs measured (Table II.).

TABLE II.—*Percentage Mortality among the Guinea-pigs*

Mortality.	Young with mothers. Per cent.	Young fed artificially on cow's milk.		
		Raw. Per cent.	Pasteurised. Per cent.	Boiled. Per cent.
First 10 days	4·0	27·74	30·13	27·56
„ 20 „	5·0	40·00	46·16	39·74
„ 30 „	6·0	45·62	51·28	42·95
First year	14·0	52·90	53·85	46·79

The percentage death-rate for the guinea-pigs left with their mothers is based on the young born alive, weaklings as well as others, but no weaklings were selected for the artificial tests. As regards weight, the boiled milk weight record is distinctly better than that of either the raw or the pasteurised milk and the pasteurised drop a little behind the raw.

Schroeder makes the suggestion that possibly the better records with the boiled milk is due to the fact that the milk of a foreign species may contain objectionable elements for another species, and that these are eliminated by the heating. It is an interesting suggestion, but in view of the fact that there was evidence of *Brucella abortus* being present in the raw milk it cannot be accepted as more than a possibility.

THE QUESTION OF THEIR VALIDITY

These animal experiments (particularly with the rat) are so frequently cited by opponents of pasteurisation as evidence that this process damages milk as a food for the human child, that it is necessary to discuss some of the nutritional factors involved which bear upon the validity of these experiments as applied to man.

The needs of the growing animal for proteins, calcium, and phosphorus (to consider only certain elements) are conditioned by the rate of growth and by the relative development of bone and of soft tissues. These needs are reflected in the composition of the milk, and Sherman (1927)[22] gives Table III., mainly from the work of Bunge and Abderhalden.

TABLE III

Species.	Days required to double birth weight.	Percentage composition of the milk.			
		Protein.	Ash.	Calcium.	Phosphorus.
Human .	180	1·6	0·2	0·02	0·02
Horse ..	60	2·0	0·4	0·09	0·06
Cow ..	47	3·5	0·7	0·12	0·09
Goat ..	22	3·7	0·78	0·14	0·18
Sheep ..	15	4·9	0·84	0·18	0·11
Swine ..	14	5·2	0·80	0·18	0·14
Rabbit .	6	14·4	2·50	0·65	0·43

The slowly growing human child shows a very low calcium and phosphorus content in its milk as compared to the cow.

Not only is this the case for different species, but we get similar fluctuations in the composition of the milk during lactation to meet the requirements of the young. For human milk this is brought out in Table IV. from Holt, Courtney, and Fales (1915)[23]

TABLE IV.—*Human Milk During Different Periods of Lactation*

Stage.	Protein.	Ash.	CaO.	P_2O_5
Colostrum (1–12 days) ..	2·25	0·31	0·0446	0·0410
Transition (12–30 „) ..	1·56	0·24	0·0409	0·0404
Early mature (1–4 mths.)..	1·15	0·21	0·0486	0·0342
Middle mature (4–9 „)..		0·21	0·0458	0·0845
Late mature (10–12 „)..	1·07	0·20	0·0390	0·0304

These facts apply to the cow and other animals but are particularly striking as regards the rat, and as this animal is so much used in nutrition experiments it is important to realise their cogency in relation to pasteurisation.

The rat is an animal which is born largely cartilaginous, and which arrives at sexual maturity when only about 60 days old. It grows at a great rate, and its call upon a very rich milk with abundant calcium and phosphorus is insistent. Hatai (1927)[24] gives the figures for the milk shown in Table V.

TABLE V

Species.	Water.	Percentage composition of solids.			
		Protein.	Fat.	Lactose.	Ash.
Man	87·58	16·22	30·1	51·28	2·39
Cow	87·17	27·68	28·76	38·03	5·53
Rat	54·42	22·11	69·13	5·31	3·50

Unfortunately he does not give the calcium or phosphorus content, but the figures show the enormously high proportion of solids.

The insistent demand for calcium by the growing rat is clearly shown by the work of Sherman and MacLeod (1925).[25] They found for the rat that

"in round numbers the percentage of calcium in the body is found to increase from 0·25 per cent. at birth, to about 0·6 per cent. at 15 days; about 0·7 per cent. at 30 days, 0·75 to 0·85 per cent. at 60 days; 0·95 to 1·1 per cent. at 90 days, and 1·0 to 1·2 per cent. in the adult animal."

While pregnancy does not make such great demands on the rat owing to the little bone in the new-born rat, lactation, owing to the need to supply a milk so rich in calcium, causes a serious drain, as is evident from other results of Sherman and MacLeod, and more specifically in the work of Macomber (1927),[26] who fed rats on a diet intentionally low in calcium. Under these conditions he found that the mother rapidly lost calcium from her body to supply the needs of the growing young, but the young were not able to get all they required and showed signs of lack of calcium by stunting, weakness, and often death.

The same fact is brought out from another angle by Sherman and Muhlfeld (1922)[27] when they showed the superiority of a diet of one-third whole-milk powder, two-thirds ground whole-wheat over one of one-sixth whole-milk, five-sixths ground whole-wheat, measured by increase of young and percentage successfully suckled.

The importance of adequate calcium in the food for young production applies to other animals. For example, Hart and Steenbock (1919)[28] found that lack of calcium in the ration of pigs and cows caused premature births of dead or weakly young.

Since stress is laid by the opponents of pasteurisation upon the diminished fertility of rats fed with boiled milk and upon the allegation that similar results occur when pasteurised milk is used, it is worth while to refer to the considerable literature showing the unsuitability of cow's milk in any form for the rat.

Sherman, Rouse, Allen, and Woods (1919–20)[29] found that young rats on a bread and milk ration, with milk comprising one-fifth of the total calories, made normal growth, but the females usually failed to breed and no young were raised. When the food was altered so that the milk formed two-fifths of the total calories and the rest by ground whole-wheat the young were suckled without undue loss. Mattill and Conklin (1920)[30] found that on fresh milk rats made good initial growth but, beginning between the 50th and 100th day of life, especially in the females, there was a decided retardation, while there was no reproduction. The addition of iron citrate improved growth but reproduction was not successful. With dried milk (a heated milk) and 1 per cent. yeast they obtained normal growth and partially successful reproduction. Mattill, Carman, and Clayton (1924)[31] found this inability to reproduce associated with a milk diet high in fats. Waddell, Steenbock, Elvehjim, and Hart (1928)[32] used as a basal diet whole cow's milk fed fresh every morning, *ad libitum*. Their results showed good growth for four to six weeks, then the weight became stationary, then declined rapidly. With cessation of growth was a marked anæmia with a marked reduction of hæmoglobin. In a later paper (1928)[33] they showed that ashed residues of beef liver and other substances fed with milk cured the anæmia. Waddell, Steenbock, and Hart (1931)[34] found that young rats when kept on a diet of whole unheated milk develop a severe anæmia in the course of a few weeks. While the addition of small amounts of the salts of iron and copper effectively prevented the anæmia, it was found that even with these additions growth and reproduction were still subnormal. Waddell (1931)[35] remarks that total sterility in male rats has been observed on a diet of cow's milk supplemented with small amounts of iron and copper salts. This sterility is characterised by the complete disappearance of the germinal epithelium, great loss in the amount of testicular tissue, and pronounced œdema. He concludes that this sterility is not due to lack of vitamin E.

These experimental results are quoted merely to show how complicated is the problem of anæmia and faulty reproduction in the rat in relation to milk feeding, and the absurdity of basing conclusions as to pasteurisation effects upon slight differences as regards these factors with rats fed upon milk. It is obvious that new unheated milk is unsuitable as a diet for an animal like the rat which grows with great rapidity and reaches maturity at a very early age. Cow's milk does not supply the essential substances in sufficient quantities.

On the general question of the suitability of these animal experiments to obtain findings applicable to man the position is, I believe, clear-cut. When feeding experiments are made with any animal whose normal calcium requirements are equal to or in excess of the calf, the slight diminution in the available calcium of the milk which pasteurisation effects is likely to show itself by diminished growth and other symptoms. To suggest, however, that such results are applicable to man is to ignore the essential fact that the human infant needs much less calcium and phosphorus than are present in cow's milk as shown by the composition of human milk. There is nothing in any of these experiments to indicate that any unknown substance is destroyed by pasteurisation. All the results (such as they are) are explainable on a diminution of calcium and phosphorus fed to experimental animals whose need of these substances is much greater than man. They offer no evidence which can be applied to man.

[In the remaining sections of his paper, which will appear next week, Dr. Savage relates what direct evidence is available on the question whether the value of milk is diminished for the child by its pasteurisation, and discusses the practical bearing of the ascertained changes due to pasteurisation. References are given to all the work quoted.]

MEDICINE AND THE LAW

Liability for Shock without Physical Impact

In the High Court last week a plaintiff was awarded £700 damages for nervous shock due to the fall of a quantity of window glass from a firm's premises. The firm admitted that the glass fell and that it constituted a nuisance; but it did not admit that the plaintiff had suffered nervous shock in consequence, as she alleged. The brief report leaves the facts obscure; the case, however, seems to have been one where personal injury consisted of shock without physical impact. Not every startling accident, of course, gives a right of action; there must be some breach of duty by the defendant (some negligence, for instance) if the plaintiff is to succeed. The damage, moreover, must not be too remote.

In the nineteenth century the courts were disinclined to allow damages for mere shock. It was difficult to prove the incidence of the invisible injury, and there was perhaps what Lord Atkin has called "a belated psychology which falsely removed mental phenomena from the world of physical phenomena." The law was reluctant to give a right of action for the

mere sensation of fright lest, as was said in Victorian Railways Commissioners *v.* Coultas (1888), a wide field should be opened to imaginary claims. Mrs. Coultas saw a train approaching at a level crossing; being put in peril by the railway's negligence, she thought she was going to be killed. The Privy Council held that damages arising from mere sudden terror, unaccompanied by any actual physical injury but occasioning a nervous or mental shock, could not be deemed legally to flow from the railway servant's negligence. A different view was taken in Pugh *v.* London and Brighton Railway (1896) where a signalman was incapacitated through shock due to the excitement and alarm of successfully averting a train smash. He was never in personal danger himself but he was held to have been incapacitated from employment by reason of accident. In 1901 the decision in Dulieu *v.* White awarded damages to a woman who was sitting behind the bar in a public-house when a horse-van, negligently driven by defendant's servant, dashed into the premises. She was untouched, but she sustained shock and gave birth to a child prematurely. She succeeded in her claim though there was still a hint that she would have failed if she had proved no more than a "merely transitory mental emotion." There may be other faulty conduct on the part of a defendant, apart from negligence. Wilkinson and Wife *v.* Downton (1897) was a case of a silly practical joke. Defendant, as the jury found, falsely and maliciously told a woman that her husband had met with a bad accident and broken both his legs; she suffered a severe shock on hearing the news, and was held entitled to succeed. Somewhat similar was the decision in Janvier *v.* Sweeney and Barker (1919). Sweeney, a private detective, instructed Barker to endeavour to induce Mlle. Janvier to show him certain documents. Barker tried to achieve his object by threats and false statements. He pretended he came from Scotland Yard. "You are the woman we want," he said; "you have been corresponding with a German spy." Plaintiff said she had so bad a shock that she suffered from neurasthenia and shingles. She sued for damages and succeeded, the judges definitely discountenancing the decision in Victorian Railways Commissioners *v.* Coultas, on which the defendants relied.

We see therefore that A may owe a duty to B not to inflict a mental shock on him or her and, if A nevertheless inflicts the shock on B and physical damage ensues, B may have a legal right of action even though (in Lord Phillimore's words) "the medium through which the damage has been inflicted is the mind." One interesting case raises wide questions. In Hambrook *v.* Stokes Bros. (1925) a lorry had negligently been left on a slope at Folkestone with the wheels straight and the engine running. It started off by itself and injured a little girl. Her mother knew the girl was in the road; the mother did not see the accident but she heard the progress of the lorry, which eventually came to a stop close to her; when told by a by-stander of the little girl's injury she knew it was her child. The mother became hysterical through shock and died ten days later in hospital. The judge told the jury that unless death was due to shock caused by fear of harm for herself as contrasted with fear of harm for her child, damages were not recoverable. The Court of Appeal, by a majority decision, held that this was a misdirection. The husband could recover damages if he could prove that his wife's death resulted from shock caused by the lorry running away, that the shock came from something she either saw or realised by her unaided senses and not from something which someone told her, and that the shock was due to a reasonable fear of immediate personal injury either to herself or to her children. It was, we must suppose, natural that a mother should be anxious for her child; the mother's shock would be a reasonable consequence of the lorry-driver's negligence. Atkin, L. J., went further. He was prepared to allow a right of action even to a passer-by on the road "who receives injury in the same way from apprehension of, or the actual sight of, injury to a third party." This opens a wide prospect indeed. A negligent motorist whose driving leads to a gruesome accident at Charing Cross might be sued by dozens of spectators on a crowded pavement. This extension of the law was not necessary to the decision in Hambrook's case, and it must not be taken as an established principle.

PREVENTION AND TREATMENT OF WHOOPING-COUGH

In a recent communication P. Stocks,[1] discussing the epidemiological features of whooping-cough, expressed the opinion that in London it must now be regarded, in terms of mortality, morbidity, and loss of school attendance, as the most expensive epidemic disease of childhood. Since the disease is only notifiable in certain of the London boroughs its real ravages can only be surmised, but, even so, it is noteworthy that at the present time, as the weekly returns show, considerably more than 600 cases are at present under treatment in the infectious hospitals of the London County Council. Among the common acute specific infections the case-mortality of whooping-cough is rivalled only by that of measles, and for the same reason, the frequency of the secondary infection of broncho-pneumonia. In an address delivered to the Royal Statistical Society on Feb. 21st Mr. A. Bradford Hill, D.Sc., called attention to the heavier mortality of female children, and to the unexplained fact that the death-rates of illegitimate children of 3 months and under are less than those of legitimate children.

THE CAUSAL ORGANISM

What is the primary infection? Most workers accept the Bordet-Gengou bacillus (*Hæmophilus pertussis*) as causal. A. D. Gardner and P. H. Leslie[2] consider that there is "no longer any room for doubt" that it is the true and sole cause, and they give several reasons for this conclusion. Others are not so sure. A. R. Rich[3] does not think that the bacillus represents the whole story, and in this he is not alone. Rich points out that interstitial pneumonia which is characteristic of whooping-cough occurs also in measles and influenza, diseases in which there are strong reasons for suspecting the ætiological rôle of filtrable viruses, and further, that the mononuclear-cell infiltration of the bronchial walls which is to be seen in sections of interstitial pneumonia also occurs in pertussis uncomplicated by pneumonia. He thinks that the true cause of whooping-cough may be a filtrable virus, the Bordet-Gengou bacillus being a secondary invader, and supports his view by adducing distemper in dogs which pertussis "resembles in an extraordinary manner." Distemper is now held to be caused by a filtrable virus, the *B. bronchisepticus* being merely

[1] THE LANCET, Jan. 28th, p. 213, and Feb. 4th, pp. 265 and 257.
[2] Ibid., 1932, i., 9.
[3] Bull. Johns Hopkins Hosp., 1932, li., 346.

a concomitant invader. Rich suggests that this organism, the Bordet-Gengou bacillus, and the influenza bacillus tend to localise in the cilia of the trachea and bronchi, and provoke coughing by the irritative effect of their presence in this sensitive site. Whether or not *Hæmophilus pertussis* is the causal organism, Gardner and Leslie were able to detect it in at least three out of four cases in the early stages of the disease by a single examination, using the cough-droplet or cough-plate method and the Danish modification of the original Bordet-Gengou medium; these results are comparable with those of H. Madsen (1924) and Sauer and Hambrecht (1930) in a much longer series of cases. A. R. Thompson,[4] on the contrary, with the same method and the same medium, freshly prepared, obtained only 7 positive results out of 64 cultures taken during the catarrhal and early spasmodic phase. A. Sundal [5] commonly uses two plates for each child, since he has found that colonies may develop upon one and not upon the other.

With the proviso that a negative result is not conclusive, the cough-droplet method may be accepted as a valuable means of diagnosis of the disease at a period of great infectivity, and when signs and symptoms present nothing characteristic. It is true that leucocytosis, with relative lymphocytosis, occurs quite early in whooping-cough, but even if facilities are available, a high lymphocyte count in very young children may be no more than suggestive, whereas recovery of the *H. pertussis* is conclusive of infection. In the spasmodic phase the diagnosis can hardly be in doubt, but R. Neurath [6] draws attention to the difficulties in infants and adults in whom the disease may remain quite atypical but nevertheless infective.

PROPHYLAXIS

There is difference of opinion as to the prophylactic value of vaccines prepared from *H. pertussis*. H. Madsen and his co-workers have reported a considerable measure of success upon a large scale, and R. Steindler [7] mentions a number whose experience has been similar; others, however, have had no success at all. Gardner and Leslie point out that unless the vaccine is prepared from organisms in the correct antigenic phase it is useless, and it is noteworthy that those who have reported favourably upon vaccine prophylaxis have either obtained the products of certain laboratories or have taken great care to see that they used freshly prepared vaccines from suitable strains. Old stock vaccines are valueless. Sundal gives an instructive account of vaccine prophylaxis in a children's home at Oslo. There were 32 children in the home, of whom 10 had a previous history of the disease. Two children began to cough; the plates were positive. From the organisms so recovered a vaccine was prepared (1000 millions per c.cm.) and injected both into these two children and into the remaining 20 susceptibles in a first dose of 0·5 c.cm. and two succeeding doses of 1·0 c.cm. at intervals of four days. The two children were not isolated, but played and ate with the others. These two developed marked cough with vomiting shortly after the last injection. Four others, between one and two weeks after the last injection, developed conjunctivitis and a cough without whoop. The other 16 children remained free from symptoms. Sundal thinks that it is not reasonable to suppose that without the vaccine these children, with no previous history of infection, could have remained exposed to massive infection without evident whooping-cough developing. L. Sauer,[8] using only vaccines prepared from recently isolated strongly hæmolytic strains grown upon human blood and the like, has injected, during the last four years, about 300 non-immune children without any untoward symptoms. Sauer finds that the vaccine, like the disease, produces a high lymphocytosis. Discussing results, he distinguishes carefully between "certain" and merely "probable" exposure. Only when the patient disseminates the bacilli, and the exposed child in the immediate environment (within a foot or two) aspirates the germ, does actual exposure occur. Sauer gives details of eight injected children of five families and six non-immune controls. All six controls (and a mother) "developed unquestionable whooping-cough from two and a half months to three years after their brothers and sisters had been injected." With one possible exception none of the injected children developed any sign or symptom, although they were daily exposed to the patients throughout the incubation, catarrhal, and paroxysmal stages. Amongst 127 injected children who experienced transient or accidental exposure none developed whooping-cough. Further work with suitable vaccines under adequately controlled conditions is clearly called for.

THERAPEUTICS

A sure sign of the weakness of the therapeutic case is the employment of a multiplicity of dissimilar remedies for the same disease. In the therapy of whooping-cough, counsel is darkened by premature enthusiasm for this specific or that. Steindler recalls the advice of Reitschel, that judgment of any whooping-cough remedy should only be based upon the results obtained in infants and children up to 2 years of age observed under proper clinical conditions, older children and ambulant cases being excluded from consideration. Several recent writers stress the psychological effect of injections in older children. W. Kaupe,[9] like Steindler, is favourably impressed with the therapeutic value of vaccines, and thinks that any psychological influence is purely secondary, since he has obtained good results in infants. W. Bayer asserts, upon the same page, that he has seen equally good results follow injections of distilled water. H. Steurnthal [10] has had such marked success with intramuscular injections of quinine combined with a small amount of oil of turpentine that he has not found it necessary to try vaccines. Some years ago J. Audrain advocated intramuscular injections of ether, and undoubtedly some cases respond temporarily, but ether injections are not only painful, but are generally held to be liable to cause abscesses, although this is not the experience of Sundal. E. Lorenz [11] tried Goldbloom's method of rectal injections of ether in olive oil (2 c.cm. of anæsthetic ether in 15 c.cm. of oil twice daily). He obtained no significant results after a fortnight's treatment of a series of 21 children. Others however have had partial and temporary success with this method, but, in order to be effective for more than a day or two, it is necessary steadily to increase the dose of ether.

As Neurath remarks, the pharmacology of the treatment of whooping-cough fills volumes. It is clear that the last volume has not yet been written. The

[4] Ann. Rep. M.O., London County Council, 1930, vol. iv. (Part 3), p. 129.
[5] Acta Pædiat., 1932, xiv., 104.
[6] Wien. klin. Woch., 1933, xlvi., 113.
[7] Med. Klin., 1932, xxviii., 1709.
[8] Jour. Amer. Med. Assoc., Jan. 28th, 1933, p. 239.
[9] Med. Klin., 1932, xxviii., 1640.
[10] Ibid., p. 1425.
[11] Deutsch. med. Woch., 1932, lviii., 1443.

experienced practitioner realises that there is as yet no specific, and falls back, as he must, upon such symptomatic treatment as, in his experience, has procured alleviation in some at least of his cases. There are only two sheet anchors—sunshine and an abundance of fresh air—but, for only too many children, neither of these is obtainable. For others these conditions are not even sought, because whooping-cough, like measles, is considered as a disease which can be treated without medical advice, or this may be enlisted only at a stage when it can be of little avail.

IRELAND

(FROM OUR OWN CORRESPONDENT)

REFORM IN NATIONAL HEALTH INSURANCE SYSTEM

THE approved societies are concentrating their forces in opposition to the proposals for reform in the National Health Insurance Scheme which are expected to come before the Dáil in the near future, and the daily press has been giving expression to their views. The change to which most grave objection is taken is the amalgamation of all the existing approved societies—65 in number—into one "National Health Insurance Unified Society." It is stated that the Bill will provide for equal benefits for equal contributions for all insured persons between the ages of 16 and 70, who are not earning an income exceeding £250 a year, and all such employed must be insured. Manual workers must be insured, irrespective of income. It is pointed out that 43 of the 65 approved societies give additional benefits at present, the additional benefits being of varied nature. It is suggested that these additional benefits which the better managed societies have been able to provide will disappear in the future, and that, in fact, the stronger societies will be compelled to carry the worker on their backs. Despite the protests of the approved societies, it is unlikely that the Government will alter its intention concerning insurance. The concentration of the manifold, but, at present, scattered influences of the several approved societies into one society is not attractive to the medical profession, whose interests up to the present have received little respect from the societies.

THE DOCTOR'S DAY

"Come, tell me how you live," I cried,
"And what it is you do!"

XVI.—METROPOLITAN HEALTH OFFICER

THE medical officer of health of a metropolitan borough shares responsibility for the health of a large and populous area with the chief medical officer of the London County Council. The latter is responsible amongst other things for the provision of institutional medical treatment and the medical inspection and treatment of school-children. My borough is a fairly typical one, but administrative arrangements differ greatly in the London boroughs. I live about a mile from my office, which opens at 9 A.M.; it is not necessary for me to arrive before 9.30 A.M., by which time my correspondence has been opened and sorted, all letters of importance being ready for me to read. Amongst those requiring immediate attention are the "complaints," that is, information as to insanitary conditions requiring to be investigated. Some complaints are anonymous; these are not ignored, but entered with the others in a register, so that they may all be accounted for in due course. Notifications of infectious diseases are entered in a register and handed to the sanitary inspectors, unless I decide to visit personally.

I ring for the typist and dictate some letters. Others will be drafted for me by my chief clerk. By this time there is ready for me a report on the disinfections performed on the previous day. I also read over a summary of each health visitor's and sanitary inspector's previous day's work and interview any of these officers that wish to consult me. This will be for the purpose of seeking my advice or to arrange for me to visit premises. I am well isolated from telephone interruptions, but here is a doctor put through to me. He saw a woman yesterday with a sore-throat which he diagnosed as tonsillitis; before leaving the house he decided to take a throat swab; he informs me that the swab has been reported positive to diphtheria but that he said nothing to the patient about this possibility and feels in a difficulty. My obvious course is to visit the patient, advise as to diagnosis, and smooth away any difficulties. It is sometimes forgotten that to swab a sore-throat is to suspect diphtheria, and that a suspect diphtheria must be treated as such until the contrary is proved.

SOME CALLERS

It is now after 10 o'clock and there are persons waiting for interview. The first is a boarding-house keeper. It appears that rats are reported in the neighbourhood and that an inquisitive borough council workman has been creeping along the sewer. He reports that the drain from her house is an old brick one, which has collapsed, thus enabling rats to leave the sewer. She has learnt to her dismay that she is responsible for the repair of the drain, not only on her premises, but as it proceeds under the road to the sewer. The estimated cost of the repair is £50, but she has fallen on lean times and cannot find the money at once. After some discussion it is agreed that the council will do the necessary repairs and that she will repay the cost by instalments. The next caller is an irate father who complains to me about a call paid to his house by a uniformed N.S.P.C.C. inspector. He cites one of my health visitors as being responsible for this invasion of his privacy and appeals to me to protect him from further molestation. The *corpus delicti* is produced, in the person of little Henry. He is pale and flabby, and has bandy legs. His mother, under my cross-examination, admits that the child has not been to hospital about his legs for two months. I speak forcibly to the parents and approve of the health visitor's action. I think I have done Henry a good turn.

Next my old friend Councillor —— comes in. He is retired and has plenty of time to spare. He is much concerned about the welfare of his fellow men, and 20 minutes of my valuable time pass by pleasantly. I next find that a mother and her child with a running nose are waiting to see me. This child was in hospital for three months with scarlet fever. Seven days after its return another child in the family sickened with the disease. I called to see the mother yesterday but she was out, so that she is asked to call here by appointment. There is nothing apparently wrong with the child except the nasal condition. I advise the mother to keep it to itself as much as possible and to take it to the local children's hospital. She is too poor to go to a private doctor. This child is probably a carrier of scarlet fever infection and I detail a woman sanitary inspector to keep it under observation.

OUTDOOR VISITS

It is now 11 A.M. and I have several visits to pay. My first visit is to a room in a respectable working-class street. Here I meet a woman sanitary inspector and see a very old woman more or less confined to bed with some form of paralysis. The neighbours

complain that vermin come from her room and that an offensive smell is noticeable. The room is crammed with furniture and bundles of newspapers and it is feared that she will cause a fire. Her mattress is obviously the cause of the smell and the room and the furniture are badly infested with bed-bugs. She is not easy to reason with but I try to make it clear that unless she allows the disinfecting staff to rid the room of vermin, and unless she allows herself to be properly nursed, I shall get a magistrate's order for her removal to a municipal hospital. I am reluctant to interfere with adult persons who deliberately choose to live in a state of filth, but here other persons are affected and she herself is likely to die from inattention. She has lived in this miserable room for 20 years and dreads the idea of leaving it. My next visit is to a delicatessen shop in a residential neighbourhood, the proprietor of which has decided to fry fish for sale, in the basement. Fish-frying cannot be forbidden in London, but is strictly regulated by by-laws, and the difficulty here is the ventilation of the frying room. It will be necessary to have pavement light and ventilation and this will spoil the appearance of his attractive shop-front. I must, however, consider what effects an unventilated room may have on the health of his staff, and I am quite obdurate on the matter. I instruct the sanitary inspector that ventilation must be enforced, by legal proceedings if necessary.

Next I proceed to a small but expensive flat in the best quarter of my area, whose occupant, a professional man, is dissatisfied with what the sanitary inspector tells him. His complaint is that his wife finds the kitchen dark and badly ventilated. I find that he is using a gas-oven and cooker without a flue and that the kitchen quickly becomes overheated. It is impossible to construct a flue, and I therefore inform him that the ventilation will only be sufficient if he substitutes an electric cooker and fan. As for light, the situation absolutely prevents the access of natural light. From his remarks I gather that he has a tenancy agreement which is proving irksome and he wishes no doubt to enlist my support in his dispute with his landlord. He will be disappointed.

My borough is one of contrasts and after driving half a mile I find myself in a slum area. It is necessary that a sanitary inspector should devote his whole time to supervising these few acres, in a war waged against indifference and squalor. Many of the landlords are willing to do their best for their tenants, but a certain number can only be made to do their duty in removing sanitary defects by formal notice and the threat of legal proceedings. The inspector gets me to referee any cases which he proposes to take to the police-court. The commonest defect is "premises in such a state as to be a nuisance." I have to see two such cases. The rooms to which he takes me first have not been redecorated for some three years. The walls and ceilings are darkened and impregnated with smoke, dirt, and exhalations. Things are even worse than they appear to be, since on scraping away the wallpaper an older and even dirtier one is seen to lie underneath.

Next I am taken by the inspector to a basement tenement where dampness has shown itself on the walls. It can be seen and felt with the hand. There are various legal procedures for dealing with such a defect. It is for me to decide what is to be done. We may be able to make a closing order, prohibiting the use of the rooms for human habitation, or else for use as sleeping-rooms. We may serve a notice to repair, do the work ourselves if the owner defaults and recover the cost. We may regard the dampness as a nuisance. I advise the inspector that the latter procedure will be the most practicable, and we then proceed to discuss the details of the structural work which is necessary. Whilst in the basement I learn that the occupants are newcomers to the borough and have a baby. I make a note of the name and address so that the health visitor may pay a call. The inspector takes the opportunity of asking me to see a house near by, as regards water-closet accommodation. The law requires that one closet be provided for every 12 occupants of a house. This house contains 14 occupants, the majority being small children. I am not disposed to put the landlord to the expense of providing another closet under these circumstances, but I tell the inspector that the matter must be reopened in two years' time.

THE AFTERNOON

After the lunch interval I return to the town hall, intending to spend the afternoon reading and writing at my desk. There are always papers accumulating which have to be dealt with. Later on, I remember that there are two infant consultations in session this day of the week and that I have not put in an appearance lately. At each welfare centre I interview the superintendent, say a word or two to the voluntary helpers, and put my head into the doctor's room. Everything appears to be going smoothly. On returning to my office there is a message waiting for me that a doctor would like me to see a case of suspected scarlet fever. I go out at once in order to get the advantage of the daylight. The patient is a child with a punctate erythema and a slight rise of temperature, but with no other distinctive signs, such as one might expect in the throat or tongue. My advice is to keep the child isolated and under observation. Fortunately, this is possible as the child is an only one and in a comfortable home.

There is a public health committee meeting early next week and the committee clerk comes up to see me. He is the link between me and the town clerk; he keeps me in touch with all official correspondence and drafts the agenda and minutes of the committee. We discuss which of my matters are to be brought before the committee. The public health committee is the one to which I am mainly responsible. There is also a maternity and child welfare and a housing committee. The monthly meetings of the committees loom large on my horizon. Each lasts an hour or so, but into that time a good deal is compressed. A large number of reports and letters are placed before the committee and its decision taken on various matters of detail and policy. Once a month the council meets in public. It is very rarely that I am called upon to speak at a council meeting, but I have to be there to prompt my chairman if he is interrogated on any public health matter.

SOME PERSONAL MATTERS

The foregoing is only a sketch of my duties, which are extremely varied. In addition to being a medical man I have to know something about law, sanitary engineering, and other sidelines. One drawback in my position is that I do not get much clinical experience, but London is fortunately a place where there are plenty of post-graduate facilities. Men in my position have to make up for lack of clinical work by doing plenty of general medical reading. I am a whole-time officer and am therefore debarred from engaging in practice. Apart from this, no undue restriction is placed on any activities which I may wish to pursue out of office hours, such as writing or the teaching of public health. My working week extends from Monday morning to Saturday midday, but it is quite possible for me to take Saturday off from time to time. I am allowed one month's holiday a year, which, subject to arrangement with my deputy, who is a local practitioner, I can take at any time. For one week of the year I attend one of the medical congresses, for which I get special leave of absence. A London M.O.H. is bound to live within his borough or close to it, unless he obtains permission to reside elsewhere, which is not often refused. My evenings and week-ends are usually my own, the only interruptions being occasional telephone calls and requests to see cases of infectious disease. I meet my fellow practitioners at the local medical society or at B.M.A. meetings and committees.

I have left to the last the question of remuneration, and need only say that London boroughs differ somewhat in this matter. Generally speaking, we

receive enough to live in reasonable comfort and have other compensations. Our pay is steady, we have few professional outgoings, and we lose nothing by taking a holiday. When we are ill we receive full pay, perhaps for as long as a year, and after ten years' service we receive a pension if disabled. At the retiring age, which is usually 65, the pension amounts perhaps to half or two-thirds of one's previous salary. In my somewhat detached position I often receive confidences, and whilst I may feel a twinge of envy on hearing of the earnings of the big men of the profession, I know that many men, no worse than myself, have a hard struggle to carry on. I am therefore content to pursue my interesting work for a modest reward, but I could not be happy unless I was an enthusiast for preventive medicine.

PUBLIC HEALTH SERVICES

Economy at Wigan

AT a meeting of the Wigan Education Authority on Jan. 25th reference was made to a special report submitted by Dr. H. Whitehead, medical officer of health, to a joint meeting of the committees charged with child welfare at home and at school, which asked for certain increases of staff and facilities. One of the aldermen remarked that while no doubt it was the duty of the medical officer to submit suggestions to lead to an ideal medical system, some at any rate of the members of that authority were there to think of the people who had to find the money. He mentioned the good average attendance at schools in the town, and thought they could deduce therefrom that the medical services must be sufficient and the authority ought to be extremely reluctant to make the ratepayers spend more money on reorganisation. "I may be a voice bleating in the wilderness," the *Wigan Observer* reports him as saying.

It is indeed true that the percentage attendances at the Wigan schools, for which the alderman paid a generous tribute to the school medical service and attendance officers, has been good for some years past, but this is not a criterion of the adequacy of medical organisation. Children may attend school regularly and yet have defects of serious import for their future health and efficiency. A more valid sign of the need for extension of medical care at Wigan is an infantile mortality-rate of 109 for the period 1921–30, compared with 72 for the whole country. Another that the routine medical inspections are never completed in the year, and even to get through the numbers actually done the work has to be rushed. There are few areas in England where the position is as bad, and no one who has kept a watch on this column from year to year has been in doubt that in health matters Wigan has much leeway to make up. For instance:—

> "Dr. W. Whitehead and his assistants are fighting an uphill battle. Though the report describes good progress made with orthopædic and dental schemes, yet the facts and figures show a great deal more to be done in many directions. . . . The dental staff is much too small, there is one dentist for 13,327 children, while the Board of Education recommended one for each 5000. Dr. Whitehead's statement that there is ample scope for two full-time dental surgeons is on the modest side" (THE LANCET, 1931, i., 1427).

It is for one additional dentist, two altogether, that Dr. Whitehead is now asking. These are only examples to show that what is now sought is not an "ideal" organisation, but one which makes a reasonable approach to the average of progressive areas.

The matter however goes far beyond the local needs of Wigan. If there is there one voice bleating in the wilderness, elsewhere there is a full-throated chorus calling out for reduction of "non-productive" expenditure, and the school medical service is talked of as a luxury and as an "unimportant frill" of education. But surely any practical person would say that the results obtained by coöperation of teachers with school medical service in producing children who are clean, alert, and healthy in mind and body are more important than mere academic attainment. From a financial aspect is it not a sound proposition to lessen the number of those who will be burdens on the community? An untreated untrained deaf person is rarely self-supporting, and many cripples have to be helped by the ratepayers for the period of life. All these sources of financial loss to the community, with many others, such as rheumatism, causing loss of working time greater than that of industrial disputes, can be minimised by an efficient school medical service at a cost which is relatively trifling. But the work is of little use unless it can be done properly; rushed inspections are almost valueless. Children can be inspected and records made at a rate of 25 or more a session; but such examination will fail to notice those early signs of disease in the stage when it is most easily cured. Gross defects usually cause the parents to seek advice of their own medical attendant, or at hospital; the less obvious signs, whose detection may mean so much need skilled and careful investigation. No shrewd business man would think it true economy to send out damaged goods; when things are going badly the maintenance of sound quality in the output is a primary consideration for the recovery of prosperity.

Port Sanitation

The new port sanitary regulations which come into operation on May 1st amend and consolidate the measures now in force for preventing sea-borne infection. The master of a ship arriving from abroad is required to ascertain the health of all persons on board and to complete a "declaration of health," countersigned by the ship's surgeon (if any), stating that there have or have not been on board cases suspected to be infectious. For the master who has no surgeon to help him half a dozen clinical signs of serious infectious diseases are mentioned. The master is advised in his own interest to send a wireless report in advance. The declaration of health comes into the hands of an officer of customs who, on finding no infectious disease on board and no epidemic among the rat population, gives free pratique, or, if he suspects either, detains the ship for 12 hours to give time for inspection by a medical officer of the port sanitary authority. Precautions are to be taken not only against cholera, plague, and yellow fever, but against typhus, small-pox, and all epidemic or acute infectious diseases, not including venereal disease. Standing permission may be given to the master of a daily passage boat to disembark passengers on arrival, provided he undertakes to report any suspicion of infectious disease to the medical officer by wireless. Apart from this no unauthorised person may board or leave a ship arriving from a foreign port till the ship is freed from control. Only in special circumstances do tuberculosis and the commoner infectious diseases call for the isolation of the ship. Control is now so complete and confident that mooring stations for detained ships are to be established in the docks. Powers are given to the medical officer to prevent the embarkation of persons

suspected to be suffering from the five major diseases, or to have come from an area declared by the Minister to be infected with any of these. He has also to carry out such disinfection as he thinks necessary and see that the cleaning is done by the master or by the sanitary authority at the master's expense. In the fourth schedule full details are given of the measures to be taken against these diseases, with the exception of yellow fever, which is subject to the International Sanitary Convention (Paris) of 1926. The regulations are issued with an explanatory circular, No. 1296.

County Statistics

The issue of the separate county volumes setting out the results of the 1931 census of England and Wales is proceeding apace. Some sixteen have now been published, two of the latest of which refer to Stafford and Bedfordshire. Both these counties, it is shown, increased between 1921 and 1931 at a slightly faster rate than the country as a whole; though Bedfordshire has gained, Stafford has lost, by migration during the ten years. The only novel feature introduced at the 1931 census provided for a specific return of the "usual residence" of each person, irrespectively of the address at which he or she was enumerated. In neither of these counties did the resident population differ materially from the enumerated. In Stafford, in 44 areas out of 51, and in Bedfordshire, in 12 areas out of 14, the difference—usually a deficiency of enumerated—was less than 10 per 1000. Both counties agree in showing a considerable fall in the average size of family, and accompanying it, a substantial reduction in both the numbers and proportions of persons scheduled as living in the "overcrowded" category (more than two persons per room), the rate of reduction, it is to be noted, showing great improvement over the increases recorded in the previous decade. On the other hand, it must be observed that, in Stafford, of families of six or more persons in size at the recent census there were as many as 2604 housed in but one or two rooms each, so that there is still scope for much improvement in this respect. The average age of the population in these counties has risen by about two years between 1921 and 1931, and in consequence, and in spite of the economic depression, there has been an increase in Stafford of the proportion of the population enjoying the married state.

These county volumes, of which there will be between 40 and 50, comprise the statistics which are of predominantly local interest—viz., populations and acreages of local government, Parliamentary, and certain judicial areas; statistics of private families and the rooms and dwellings in which they live; and distributions of the local populations according to sex, age, and marital condition. Upon completion of the series national volumes will be issued dealing with such subjects as occupations and industries, and summarising the county statistics.

Influenza

There was a further big decline in the number of deaths from influenza last week, the total being 630, compared with 1306 in the previous week. In London there was a corresponding fall from 261 to 130. In Scotland the outbreak is now almost over, for only 44 deaths were registered in the 16 principal towns. Fifteen of these were in Edinburgh.

Details of the number of deaths in particular towns will be found under the heading of Infectious Disease, and the following Table shows the death-rates from influenza (per 1000 per annum) in various groups of great towns during the week ended Feb. 11th. It will be seen that the mortality was reduced in every area except the south-west.

—	118 great towns.	South-eastern area.	Greater London.	Northern area.	Midland area.	Eastern area.	South-western area.	Wales and Monmouthshire
Jan. 7th	1·73	1·22	1·04	1·70	3·65	0·42	0·57	0·38
„ 14th	2·64	2·56	2·36	2·78	3·25	1·78	0·91	0·98
„ 21st	4·04	3·73	3·63	4·81	4·32	1·36	1·81	1·58
„ 28th	4·91	4·06	4·08	5·66	5·08	5·98	2·60	7·15
Feb. 4th	4·85	4·39	4·12	5·27	4·00	8·71	4·76	7·53
„ 11th	3·32	2·97	2·82	3·43	2·64	6·19	4·98	6·40

INFECTIOUS DISEASE

IN ENGLAND AND WALES DURING THE WEEK ENDED FEB. 11TH, 1933

Notifications.—The following cases of infectious disease were notified during the week:—Small-pox, 25 (last week 18); scarlet fever, 1696; diphtheria, 844; enteric fever, 12; acute pneumonia (primary or influenzal), 4106 (last three weeks 3781, 4821, 5151); puerperal fever, 41; puerperal pyrexia, 125; cerebro-spinal fever, 84 (last three weeks 61, 66, 90); acute poliomyelitis, 10; encephalitis lethargica, 17; dysentery, 16; ophthalmia neonatorum, 82. No case of cholera, plague, or typhus fever was notified during the week.

The number of cases in the Infectious Hospitals of the London County Council on Feb. 14th–15th was as follows:—Small-pox, 60 under treatment, 6 under observation (last week 56 and 4 respectively); scarlet fever, 1583; diphtheria, 1572; enteric fever, 8; measles, 291; whooping-cough, 669; puerperal fever, 28 (plus 11 babies); encephalitis lethargica, 231; poliomyelitis, 1; "other diseases," 323. At St. Margaret's Hospital there were 13 babies (plus 9 mothers) with ophthalmia neonatorum.

Deaths.—In 118 great towns, including London, there was no death from small-pox, 1 (0) from enteric fever, 28 (1) from measles, 10 (5) from scarlet fever, 70 (20) from whooping-cough, 38 (7) from diphtheria, 44 (8) from diarrhœa and enteritis under two years, and 1306 (261) from influenza. The figures in parentheses are those for London itself.

The towns which reported the largest number of deaths from influenza were as follows, last week's figures being given in parentheses: Bradford 43 (38), Manchester 41 (87), Hull 40 (49), Liverpool 33 (49), Swansea 30 (25), Sheffield 28 (63), Bristol 27 (62), Birmingham 24 (21), Stoke-on-Trent 24 (34), Norwich 21 (26), Blackburn 20 (16), Bolton 20 (21).

Hull reported 1 death from enteric fever. Five fatal cases of measles were reported from Liverpool, 4 from Birmingham, 3 from Burnley. Deaths from whooping-cough were still widely distributed, 6 being reported from Leeds, 5 from St. Helens, 4 from Wolverhampton, each 3 from Leicester and Liverpool. Diphtheria claimed 6 victims at Liverpool, 4 at Hull.

The number of stillbirths notified during the week was 314 (corresponding to a rate of 47 per 1000 total births), including 38 in London.

WEST HARTLEPOOL INFECTIOUS DISEASES HOSPITAL. Alderman Clarkson, chairman of the health committee, last week opened an infectious diseases hospital at West Hartlepool which has cost £40,000. The scarlet fever block provides accommodation for 22, and the diphtheria block for 16 patients, and provision has been made for 16 sisters and nurses.

CORRESPONDENCE

CONTROL OF INFECTIONS IN CHILDREN'S WARDS

To the Editor of THE LANCET

SIR,—The leading article in your last issue should remind those on whom rests the responsibility of sending or receiving children into institutions how serious the risks and consequences of infections may be in such places. There can be no doubt that we are groping towards a partial solution of the problem through the coöperation of medical staffs, administrators, and architects in the planning and building of newer hospitals with smaller ward units. But mere structural arrangement, vitally important though it be, deals with only one aspect of it. In hospitals it may be necessary to do away with large wards and to restrict the number of cots in each room to two, as is suggested in your description of Wieland's new children's hospital in Basle, but this will not be found practicable for all institutions even if it were desirable.

It is of first importance to appreciate which particular infections are most dangerous and what age and type of child most likely to be affected. Most of us with experience of the hospital treatment of children will readily agree with your view that it is the introduction of non-specific infections such as the virus of the common cold or of "influenza," and the mixed flora of broncho-pneumonia, amongst children already ill, that is to be feared more than infection with so-called specific fevers such as measles, diphtheria, and scarlet fever, outbreaks of which are relatively easy to avoid or control. But this view needs reinforcing by recognition of the fact that it is mainly towards the infants that the danger is directed, and that a respiratory or tonsillar infection may be harmless in a 5-year-old child and "of serious clinical consequence" when transmitted to an adjacent infant.

The immediate social importance of this state of affairs is that there is now astir an increasing interest in diseases of infancy, and that this will probably lead to the opening of new hospitals and infants' wards by municipal authorities and other public bodies. This is a matter which should not be contemplated lightly. If this be doubted the recent words of one of the most eminent of the world's pædiatricians should be read: "The herding of infants in separate wards where the individualisation and mothering of the home are wanting, where exposure to infections of the respiratory tract leads to more institutional casualties than one can contemplate with serenity of mind and of heart, is fraught with such danger that one often wonders if it were not better to abolish them altogether . . ."[1] If this be the opinion of one whose hospital appears to the visitor to leave nothing to be desired, well may others search their hearts and question themselves concerning ward infections in hospitals to which they themselves send or receive children for treatment. This danger to infants is well illustrated by the results of the treatment for pyloric stenosis, for which the stay in hospital is usually limited to as short a period as possible. In private practice a mortality of 10 per cent. is expected. In hospitals a mortality of 30 per cent. is frequently exceeded. The risks in other diseases requiring a more prolonged stay can be suspected.

While it is my object to emphasise the danger of ward infections particularly in young infants, I am no advocate of the defeatist policy of closing the infants' wards. My hospital experience—formerly bitter, now less so—convinces me that with thought and care on the part of the staff and nurses, and with proper structural and administrative arrangements, these dangers can be avoided and hospital treatment rendered as safe for the infant as for patients of other ages. Moreover, the study in hospital and the ultimate mastery and avoidance of these infections will throw light on the various disorders so rife amongst the children of the ill-housed classes.

It is difficult to cite brief rules by the application of which ward infections can be avoided. Small ward units with adequate milk kitchen arrangements; facilities for nursing mothers to be admitted with their babies; the segregation of infants into groups of approximately the same ages; the realisation that a sudden loss of weight due to "gastro-enteritis" or "acute intoxication" appearing while the child sojourns in hospital is probably due to a ward infection; the limitation of a nurse's services to one or two babies; the use of lay help if necessary; the recognition of the danger of tonsillitis or septic sores in a nurse; the safeguarding of the nurses' health by adequate holidays and recreation; the recognition of the danger of a discharging empyema infecting another child; the necessity for spare wards so that a ward may be completely emptied once a month for cleansing—these are some of the important points which rise to the mind. But when all this is done, when all techinical details have been ordered and obeyed, success will still wait upon the enthusiasm of the nursing staff, and the interest of a medical staff capable of recognising how little of disease in infancy is due to "feeding disorders," and how much to infection.

I am, Sir, yours faithfully,

Newcastle-upon-Tyne, Feb. 19th, 1933. J. C. SPENCE.

[1] Brennemann, J.: Amer. Jour. Dis. Child., 1930, xl., 1.

EARLY DIAGNOSIS OF MALIGNANT DISEASE

To the Editor of THE LANCET

SIR,—Your annotation and Mr. Donaldson's letter raise the question of the expediency of periodic medical examinations which Mr. Donaldson advocates so warmly and so persuasively. May I be allowed to comment as one generally interested?

The most sceptical of pessimists will scarcely have the hardihood to urge that we should not try to discover malignant and other more tractable diseases in their early stages if we can, and our chances of doing so would no doubt be increased by examining our patients frequently and regularly without waiting for symptoms. A good theoretical case can be made out for the periodic examination of everyone from birth to the onset of old age, and a generation which regarded the human body with the reverence we reserve for our machines would probably arrange for it to be done. Our own generation, however, seems to have more fear of disease than love of health; we ourselves are not free from the belief that it is our sole function to search out abnormalities, to declare them and to correct them if we can, and we are still far from the day when the reproach of having imagined a pathological condition will be esteemed as great or greater than the reproach of having overlooked one. In consequence periodic examination, if it were now instituted, might prove to be a mixed or doubtful blessing.

To the credit of its account could be placed the gradual extension and diffusion of knowledge and understanding of the normal, the discovery (leading to

removal) of local sources of infection, of unsuspected ocular defects, and of a few other remediable but unobtrusive troubles; occasionally, if the examination were very complete, some actual systemic disease might be discovered in its early stages and checked, but I think not very often. No doubt a proportion of those examined would be relieved of fears which they would not have had the courage to carry to their doctor, and it is to be hoped a fair amount of good advice on personal hygiene would be spread abroad.

But on the debit side would have to be placed the unfortunate and unprofitable discovery of cardiac murmurs, tachycardias and innocent arrhythmias, impaired percussion notes at the right apex, movable kidneys, unconventional blood pressures, pallors simulating anæmia, retroversions of the uterus, tendernesses in the right iliac fossa—all the familiar props of invalidism, all inviting misinterpretation, all capable, if probed too long or too often or mentioned a thought too earnestly, of spoiling a useful life. If the account were cast in terms of human health and happiness is it not doubtful on which side the balance would be found?

But this, Mr. Donaldson might say, is going far beyond what he advocates. He only suggests that women who have reached an age when cancer may begin should be encouraged to visit their doctors regularly to be overhauled.

The difficulties still seem to me great. How often is the examination to be made? How far is it to be carried? What does the doctor undertake to do for the patient? An ad-hoc examination, directed only to the likeliest cancer sites, guarantees nothing and must, I should suppose, be for any patient of ordinary courage cumulatively alarming, and for a timid or introspective one completely demoralising. True, at the last examination the doctor saw nothing abnormal through the vaginal speculum or the proctoscope, but he is to look again in six months or three. How long can this fortunate immunity last? What will he see next time? What kind of reassurance is that which lasts at most six months? On the other hand an examination professing to be a general overhaul must cover a wide and undefinable field. To be worth anything it must be carried at least to life insurance limits, and yet as the patient approaches the age at which the irreversible and final degenerations begin to show themselves the humane examiner will find it harder and harder to decide how far to go, what to reveal, what to reserve, and what advice to give; nor will he easily banish from his own mind the fear of a day on which at some six-monthly examination of a faithful patient he will discover not an early but an inoperable growth.

Let it be conceded at once that we should examine, thoroughly and sympathetically, any patient whom we know or guess to be afraid of cancer. From my own experience I should have supposed we all do so, time and again; carcinophobia is a very widespread disorder, commonest perhaps in healthy young men, and surely it must be uncommon for a patient to be laughed at by his or her own family doctor for an honest if fantastic fear. But periodic examination should, I submit, be confined to the young, should on no account be promoted by propaganda, and should not be directed to a single issue.

The case of London school-children is perhaps worth considering. They are submitted to periodic general examinations in school, which are accepted as a matter of routine, and by general consent do good. But many of them have lately been submitted to repeated examination, accompanied by vigorous propaganda and directed solely to the detection of early rheumatism or even "pre-rheumatism." The arguments used are almost precisely those used concerning cancer, though perhaps they are more insecurely founded. Little stress is laid on the difficulties of diagnosis, none on the dangers of diagnosing rheumatism where none exists, and it is implied that there is some efficacious treatment which would "save the heart" if only it could be applied early.

No one will ever be able to balance the accounts of this campaign, for all its effects can never be known; but those of us who work in schools and in children's hospitals see enough to be sure that there are very big items on the debit side.

I am, Sir, yours faithfully,

Hampstead, Feb. 15th, 1933. LINDSEY W. BATTEN.

MALIGNANCY IN RADIO-ACTIVE PERSONS

To the Editor of THE LANCET

SIR,—In a recent leading article (Dec. 31st, 1932, p. 1439) you say that in 1926 Dr. Martland was the first to publish observations on this important occupational affection. For the sake of historical accuracy, I desire to call your attention to the fact that at the annual meeting of the industrial medicine and public health section of the American Medical Association held in Atlantic City in May, 1925, I presented unmistakable evidence of this fact on the basis of my own investigation which, as far as I know, was the first made public on that question.

My investigation was an original study of the facts of the disease as it appeared in a number of girls employed in the radium plant in Orange, near Newark, New Jersey. The reprint of my paper contained all the essential facts, establishing the occupational origin of this disease to which I gave the name radium (mesothorium) necrosis. But it requires to be said, as pointed out in my address, that as early as September, 1924, Dr. Theodore Blum, a dentist in New York City, in an address before the American Dental Association referred to it in an obscure footnote reading as follows:—

> "During January, 1924, there came under my observation a case of osteomyelitis of the mandible and maxilla, somewhat similar to phosphorus necrosis, which, however, was caused by some radio-active substance used in the manufacture of luminous dials for watches. The condition has been termed 'radium jaw.'"

This note, however, attracted no attention, and has not, as far as I know, been referred to by anyone writing on the subject.

I concluded my paper with the remark:

> "In any event, however, we are dealing with an entirely new occupational affection demanding the utmost attention on the part of those who are in a position to render the necessary technical assistance, but at the same time it is a safe assumption that if the insanitary habit of wetting the brush with the lips is done away with the disease itself will probably tend to disappear, or in any event become extremely rare."

This conclusion has been fulfilled since there have been no entirely new cases in the meantime, although old cases have increased as the facts have come to public notice. I recently had a call from the first case seen by me, a young woman about 32 years of age, who is now in reasonably good health and free from all pain, suffering only from a shortened limb after the disease had settled in the pelvis.

Dr. Martland has done outstanding service in giving technical attention to the true nature of this affection, and his papers on the subject are classics in medical

literature. By a fortunate coincidence his services were available to the girls since he is city physician in Newark, New Jersey.

I am, Sir, yours faithfully,

FREDERICK L. HOFFMAN.

Wellesley Hills, Massachusetts, Feb. 2nd, 1933.

MIGRAINE AND PREMENSTRUAL HEADACHES

To the Editor of THE LANCET

SIR,—The difference between Dr. A. P. Thomson and Drs. Macdonald Critchley and Ferguson is of general as well as special interest. It seems a pity that we should spend time in discussing, even nominally, what may be "the" cause of "a" disease. It should be clear by now that "diseases" are what Bentham called "fictitious entities"! And whether the kind of premenstrual headache described by Dr. Thomson is a "migraine variant" or not, is a question best answered according to the "taste and fancy" of those concerned with it. It has no objectivity. A fortiori, when we speak of "the" cause of any fictitious entity we mean, as Mercier said, that factor which most interests us for the purpose. In seeking such "causes" we are really seeking defining-correlatives (for nosological purposes) which may be of singularly little clinical importance, unless making an academic diagnosis of the label-sticking variety be considered important. But, when dealing, in the world of clinical realities, with, say, the complaints of Mrs. Smith about her premenstrual headaches, we have to do, not with defining-correlatives, but with such departures from the fictive normal, present to Mrs. Smith, as experience shows us are germane to the matter. Amongst these a bridged sella turcica is very likely to be prominent. But its relevance is not in the least impugned by the fact that Mr. Smith, who also has a bridged sella turcica, neither menstruates nor has headaches. For, as the theory of organ-inferiorities helps us to understand is the case, a bridged sella, like many another abnormality, may assume importance, or have importance thrust upon it, in times of psychological stress, which it would not otherwise achieve.

Dr. Thomson's original paper[1] does suggest to me that his patients are the subject of what is compendiously called the "masculine protest." Indeed, the woman who is satisfied with her position, *qua* muliebrity, does *not* suffer premenstrual headache; Dr. Margaret Jackson's patient,[2] I am sure, is not one of these. In the dissatisfied women the pituitary seems to play, premenstrually, the kind of special rôle that the error of refraction or of muscle balance does in "ocular" migraine, and that conditions of Oddi's sphincter and Vater's ampulla do in the more "bilious" variety.

There is, therefore, much to be said from the psychological point of view in relevance to the whole problem of migraine. Unfortunately, although Drs. Macdonald Critchley and Ferguson do hint that psychical stresses are sometimes obvious, and do use—not quite correctly—the "rage and humiliation" cliché for which I must take responsibility, they do not set out the psychological "case," and give no reference other than to Dr. Hilda Weber's capital paper, in which no complete presentation was, I fancy, intended. But, as Dr. Weber does, in some sense, base her remarks on a reference to my views, I will be glad if I may very briefly restate these.

In "Migraine and other Common Neuroses" (1926) I wrote that the man or woman who complains of migraine or of trigeminal neuralgia is, I think, without exception, placed in some situation which gives rise to an unexpressed or unrecognised emotion of, to use Adler's words, rage and humiliation. And again, that if the present psychological state of anyone who seeks relief from migraine be investigated, it will be found that, *although the patient himself will at first deny the fact*, yet always the mental content, in the neighbourhood of the paroxysms, or during their persistence, is one that, in Adler's phrase, is coloured by repressed "rage and humiliation" (pp. 48, 78). These statements imply no *theory*; they are based upon many observations and are open to corroboration or refutation. Those who know how to examine, usually agree with me; those who don't often do not. (A little while ago a medical man strenuously disputed with me, for an hour, that *his* inveterate migraine had any such psychological significance. The next day a friend told me, incidentally, that the doctor in question had "always a grievance and never a bob.")

But, although insistent on the *necessity* of the psychological factor, I have always stressed the importance of a complete assessment of the *whole individual* (pp. 64–66) and that it is vital in treatment that the organ-inferiority be remedied or compensated, so far as in our power. If I say that, however meticulous the general treatment, even though relief from paroxysms be obtained, the patient does not become *well* unless the psychological situation is elucidated or adjusted (p. 77), I am as far from disparaging general treatment as I am from disparaging psychotherapy in saying (what I believe to be true) that that *alone* does not give the best results.

In a word, the plea overlooked by Drs. Macdonald Critchley and Ferguson (as, inferentially by Dr. Thomson) is one (not found, I think, in Dr. Weber's paper) for examination, diagnosis, and treatment of the *individual as an individual, a whole, a psychosomatic unity*. Believing that men and women are best dealt with, clinically as well as socially, *as* psychosomatic unities and not as mind-body-dualities, I find no difficulty in tracing, in every case, in some degree, not only what is called a psychical, but a somatic element, whether or not the latter be organic and morphological or functional and neuro-humoral. Surely it is time we turned away from the dregs of theologico-scholastic Aristotelianism lurking in our muddy talk about clinical entities and specific causes! D. H. Lawrence has put the matter once and for all in his "Last Poems."

> "When I went to the scientific doctor
> I realized what a lust there was in him to wreak his
> so-called science on me
> and reduce me to the level of a thing.
> So I said: Good-morning! and left him."

The key to understanding migraine and premenstrual headaches and their "variants" lies, not in neurology and in biochemistry—though these play their parts—but in remembering that the sufferers are men and women in this world.

I am, Sir, yours faithfully,

F. G. CROOKSHANK.

Wimpole-street, W., Feb. 11th, 1933.

[1] THE LANCET, 1932, ii., 229.
[2] Ibid., 1932, ii., 595.

SURGICAL TREATMENT OF PULMONARY TUBERCLE

To the Editor of THE LANCET

SIR,—Your last issue, with its several references to the active treatment of pulmonary tuberculosis, prompts me to the following comments.

1. The "Früh-infiltrat" has a *bad* prognosis. The indication for collapse by air is not cavitation but

extension or breaking down of the atelectatic area. To await a clear picture of cavity is to risk adherence of the lung to the thoracic wall. The second radiogram on which the decision as to collapse must be made is not to be delayed longer than ten days, because breaking down of the area may occur with terrifying rapidity.

2. The interesting case described by Dr. Hudson well illustrates the teaching of Turban [1] that natural healing of a cavity, if it is to occur at all, takes place quickly. Conservative treatment is only justified if successive radiograms taken at very short intervals show diminution.

3. The prognosis of the patient with cavitation of the lung is bad; Lydtin [2] traced 771 such patients and found that there was a mortality of 98 per cent. within a few years. Modern methods have rendered the accurate diagnosis of a cavity possible, but an accurate prognosis is a contradiction in terms. It would therefore seem unwise to assure any given patient suffering from this condition that he will survive 10, 20, or 30 years—free to distribute, if only intermittently, tubercle bacilli to his immediate circle.

4. The performance of a partial thoracoplasty to produce collapse of the lower lobe of the lung in phthisis is an operation for which there is no justification, and in no informed European centre is it even contemplated. It is therefore a little surprising to find the recent work of Charrier and Loubat described as giving a balanced view of the modern surgical treatment of pulmonary tuberculosis because in their comparatively small experience these authors appear to have carried out the operation with some frequency.

I am, Sir, yours faithfully,

LAURENCE O'SHAUGHNESSY.

Royal College of Surgeons of England, Lincoln's Inn-fields, W.C., Feb. 19th, 1933.

LYMPHO-GRANULOMA INGUINALE

To the Editor of THE LANCET

SIR,—Will you permit me to make clearer a statement in the paper in your last issue by my friend Dr. Stannus? As it stands it might be taken to mean that among 10,000 examinations at the Albert Dock Hospital venereal diseases clinic only two doubtful cases of lympho-granuloma inguinale had been recognised. In fact, since 1920 and up to date, 93 cases of climatic bubo (Scheube), occurring in men of European, Asiatic, and African race, have been recognised in the clinic.

The condition, therefore, has been known and looked for at the hospital. The two doubtful cases have been—one, a young white seaman who had not been away from the coasts of Britain, where the clinical doubt was whether it was climatic bubo; and another, a white seaman, where, although the diagnosis was confirmed by positive skin reaction (Mr. A. H. Walters) and by reproduction of bubo in the guinea-pig by Dr. Marshall Findlay, there could be no reliance on the patient's varying statements as to when and where he had acquired the infection. All the other 92 cases were seafarers, and had acquired their infection in the tropics or sub-tropics. For comparison it is interesting to note that of the many landsmen from the district who have attended the hospital V.D. clinic, none has yet been seen with climatic bubo.

I am, Sir, yours faithfully,

H. M. HANSCHELL,

Hon. Medical Superintendent and Medical Officer, i/c V.D. Clinic, Seamen's Hospital, Royal Albert Docks, E.16.

Feb. 20th, 1933.

[1] Turban, K.: Zeits. f. Tub., 1924, xli., 357.
[2] Lydtin, K.: Beitr. z. Klin. d. Tub., 1925, lxii., 308.

NON-TROPICAL SPRUE

To the Editor of THE LANCET

SIR,—Unfortunately, my attention has not been called till now to a review of my book "Non-tropical Sprue" which appeared in THE LANCET of Dec. 3rd, 1932, p. 1221. It appears to me that the reviewer has misunderstood my comments and views on some very essential points, and this has occasioned an unjustified criticism of my work. I may add that, as far as I know, no other reviewer of my book has misunderstood me in this manner, so that the fault can hardly altogether lie in my presentation of the subject.

Evidently the reviewer does not realise exactly what is meant by the terms "non-tropical sprue" and "idiopathic steatorrhœa," and he fails to grasp the main purpose of my book. Non-tropical sprue is a sprue-like disease occurring in adult persons who have never been in the tropics. Idiopathic steatorrhœa comprises cœliac disease in children, tropical sprue and non-tropical sprue as near-related, probably identical, diseases. The term "idiopathic steatorrhœa" was introduced in the literature by me in a paper published in THE LANCET (1929, i., 1086) under the title "The Cœliac Affection—Idiopathic Steatorrhœas." The purpose of my monograph is given on the first page in the following words: "The purpose of this work is then to describe the clinical picture of non-tropical sprue, to demonstrate that non-tropical sprue is identical with sprue occurring in the tropics. . . ."

The reviewer says: "Dr. Thaysen has for many years been interested in idiopathic steatorrhœa or, as he prefers to call it, non-tropical sprue." This is not correct, as the terms idiopathic steatorrhœa and non-tropical sprue are not synonymous. Nor is the reviewer correct in saying: "His (Thaysen's) main thesis, as was apparent in his earlier papers, is that non-tropical sprue is identical with tropical sprue and probably with Gee-Herter's or cœliac disease." As cited above, the purpose of my book is to demonstrate that non-tropical sprue is identical with the sprue occurring in the tropics, so that when the reviewer states that "unfortunately his analysis of cœliac disease in children is far from complete," his remark is entirely off the track, as I have not aimed at giving any complete analysis of cœliac disease in children. I have included only those clinical features that might elucidate certain points in the symptomatology of non-tropical sprue.

The reviewer further writes: "He fails to appreciate the striking fact that the majority of adult patients with idiopathic steatorrhœa have a history of diarrhœa and bone deformity during infancy." In saying this the reviewer demonstrates that he does not know the meaning which the term "non-tropical sprue" holds for others and for me. The cases he refers to are described by Parsons and others under the name "cœliac rickets," and they are cases of cœliac disease in children with production of rachitic bone deformity; some cases of such patients live to become adults. Non-tropical sprue, on the contrary, develops in adult persons, and consequently these patients will not present rachitic bone deformities but osteoporosis and a slight degree of osteomalacia. This capital difference seems to have gone quite unnoticed by the reviewer; yet he might have found it peculiar that among the authors describing cases of non-tropical sprue none has demonstrated rachitic bone deformity in this disease.

The reviewer says: "On the other hand, the difference between these two conditions (cœliac

disease and non-tropical sprue) and tropical sprue appears more significant than he suggests." As it is the main purpose of the monograph, however, to demonstrate that non-tropical sprue is identical with tropical sprue, it seems to me the reviewer might reasonably have emphasised his criticism on this particular point by informing me of the differences between these diseases, but he does not—evidently because he has misconstrued the aim of my book. In this connexion I may mention that in his review of my monograph the well-known sprue investigator, Harold H. Scott, says: "Certain small points of distinction exist between cases of tropical and non-tropical sprue, but whether those are sufficiently marked to warrant separation into two entities is doubtful." (*Tropical Diseases Bulletin*, 1933, xxx., 59.)

It seems to me that the possibility that sprue might be due to a disturbance of absorption is discussed clearly enough in the chapter "pathogenesis"; the significance of vitamin D is also mentioned there. Certainly the reviewer must have failed to notice that I recommend (on page 213) the employment of vitamin D in the treatment of non-tropical sprue.

I am, Sir, yours faithfully,

TH. E. HESS THAYSEN.

Amagerbrogade 31, Copenhagen S., Feb. 15th, 1933.

*** The nomenclature of the conditions discussed by Dr. Thaysen in his book which bears the title Non-tropical Sprue: a Study in Idiopathic Steatorrhœa, is not yet common ground. Dr. Thaysen states in his introduction: "In a paper published in THE LANCET (1929), I have tried to show that tropical sprue, 'non-tropical sprue' and Gee-Herter's disease (cœliac disease, intestinal infantilism)—grouped together under the term idiopathic steatorrhœa—are very nearly related, probably identical conditions. Subsequently, my work with these symptom complexes has convinced me, not only that these three diseases are nearly related, but that it is the same disease which occurs in the tropics as sprue, and outside the tropics as 'non-tropical sprue' in adults and as Gee-Herter's disease (cœliac disease) in children." A series of cases recently described in this country (Bennett, Hunter, and Vaughan, *Quart. Jour. Med.*, 1932, n.s., i., 603) under the name of "idiopathic steatorrhœa" suggests that most adult patients with idiopathic steatorrhœa have a history dating back into childhood. Two of these cases are included by Dr. Thaysen in his list of cases of non-tropical sprue occurring in the literature. The only reference on p. 213 to vitamin D therapy is where, having made the comment on another form of treatment that "it has to be kept up for a long time and of course the bowels have to be watched carefully" Dr. Thaysen adds "the same applies to the ergosterol treatment; irradiated ergosterol is given in doses up to 30–40,000 units a day."—ED. L.

BRITISH EMPIRE CANCER CAMPAIGN

RECEPTION AT DOWNING-STREET

THE Prime Minister and Miss Ishbel MacDonald held a reception at Downing-street on Tuesday evening last, when the guests were invited to see the ingenious film prepared by Dr. R. G. Canti in demonstration of the value of cinematography as applied to the study of tissue culture and cancer research. The cost of the film, whose educational lessons have been explained in the medical press on more than one occasion, was defrayed by the British Empire Cancer Campaign. It displays through microphotography the phenomena attending the cultivation of the living cells of normal and malignant disease, and the action of radium upon them. Through the exhibition the ever-changing condition of living cells could be observed by means of a series of pictures taken at frequent and close intervals over a long period, and subsequently speeded up. The value of such a record depends much on the fact that it can be referred to whenever desired to illustrate and illuminate phenomena observed under different conditions. The original tissue cultures were made at the Strangeways Research Laboratories in Cambridge, Dr. Canti having been associated at the commencement of the work with the late Dr. Strangeways. The apparatus used had to be specially constructed to Dr. Canti's designs, and the film was originally meant for the instruction of scientific workers. Since then its value for exhibition to public audiences has been fully recognised.

H.R.H. the Duke of York was present at the reception, which was largely attended by well-known members of the public who have shown special interest in scientific medicine, and by a representative group of the medical profession.

THE SERVICES

ROYAL NAVAL MEDICAL SERVICE

Surg. Comdr. G. P. Adshead is placed on the retd. list with the rank of Surg. Capt.

Surg. Comdr. H. E. Perkins is placed on the retd. list at own request with rank of Surg. Capt.

Surg. Lt.-Comdr. J. W. Tighe to be Surg. Comdr.

Surg. Lt. R. A. Graff to be Surg. Lt.-Comdr.

ROYAL ARMY MEDICAL CORPS

Col. E. W. Powell, late R.A.M.C., having attained the age for compulsory retirement, is placed on retd. pay.

Lt.-Col. and Bt. Col. G. A. D. Harvey to be Col.

The undermentioned relinquish their appts.: Maj. and Bt. Lt.-Col. J. M. Weddell, R.A.M.C., relinquishes his appt. as Asst. Professor of Military Surg. at the R.A. Med. Coll.

Maj. T. S. Eves to be Lt.-Col.

Lt. A. F. Kennedy to be Capt.

ARMY DENTAL CORPS

Maj. A. K. Macdonald, having attained the age for compulsory retirement, is placed on retd. pay.

The undermentioned Lts. (on prob.) are confirmed in their rank: W. A. O. Roe and C. A. Pank.

ARMY RESERVE OF OFFICERS

Maj. J. A. W. Webster, having attained the age limit of liability to recall, ceases to belong to the Res. of Off.

TERRITORIAL ARMY

Maj. W. G. Shakespeare, R.A.M.C., to be Divl. Adjt., 54th (E. Anglian) Div., vice Maj. A. R. Barlas, R.A.M.C., vacated.

Maj. J. H. Bayley, R.A.M.C., to be Divl. Adjt., 55th (W. Lan.) Div., vice Maj. C. L. Emmerson, R.A.M.C., vacated.

Maj. W. H. Kerr to be Lt.-Col. and to comd. 158th (Welsh) Fd. Amb.

Capt. C. de W. Kitcat resigns his commn.

Supernumerary for service with the O.T.C.—Maj. C. H. Carlton to be Lt.-Col. and to comd. the Med. Unit, Univ. of Lond. Contgt., Sen. Div., O.T.C.

Lt. J. M. F. Whitby (late Essex R.) to be Lt. with seniority.

INDIAN MEDICAL SERVICE

D. K. L. Lindsay to be Lt. (on prob.).

Capts. A. N. Narang, R. Labhaya, and N. C. Ramchandani relinquish their temporary commissions.

FOREIGN DECORATION

The King has given Brevet Colonel Philip Henry Mitchiner, T.D., F.R.C.S., R.A.M.C. (T.A.), His Majesty's Royal licence and authority to wear the Insignia of the Third Class of the Order of St. Sava, which has been conferred upon him by the King of Yugoslavia in recognition of valuable services rendered by him.

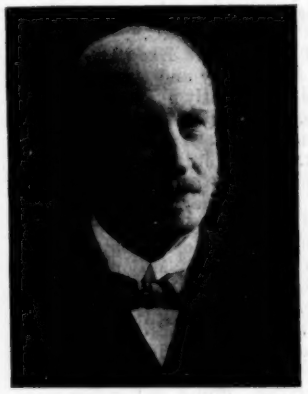
OBITUARY

SIR GEORGE BEATSON, K.C.B., K.B.E., M.D. Edin.

CONSULTING SURGEON, GLASGOW WESTERN INFIRMARY

WE regret to announce the death of Sir George Beatson, which occurred on Thursday, Feb. 16th, at his house in Glasgow in his 85th year.

George Thomas Beatson was the son of Surgeon-General Beatson, an honorary physician to Queen Victoria, who held distinguished appointments in India and saw service in the Crimean war. The son was born in Trincomalee and received his preliminary education at King William's School, Isle of Man, whence he proceeded to Clare College, Cambridge, in 1870. He graduated in arts at Cambridge and went on to Edinburgh for his medical training, taking the M.B., C.M. in 1874, and the M.D. three years later. His professional progress was rapid. House surgeon to Lord Lister, then professor of clinical surgery at Edinburgh, he moved to Glasgow and promptly acquired a professional reputation which led to his appointment as assistant to the Regius professor of surgery. At this time he became attached to the staff of the Western Infirmary, where after long service as assistant surgeon he became full surgeon in 1900. This post he occupied for 13 years, and on his retirement was elected honorary consulting surgeon.



SIR GEORGE BEATSON

[Photograph by Lafayette

During his active work in the wards of the Western Infirmary Beatson became deeply interested in the pathology of cancer as well as a successful exponent of the methods of surgical relief. He grew convinced that the rôle of fat in the ætiology and progress of malignant disease had not received proper attention. Both at operations and at autopsies he believed that he could observe a pigmented condition of the fat in cases of carcinoma. He continued his researches at the Glasgow Cancer Hospital, where he was surgeon, and in a paper in THE LANCET of 1911 he set out his theory, supported by the results of a collaborator. He admitted in that communication that to connect the fat of the body with the causation of cancer was far fetched, but submitted that there was chemical justification for the theory. Since that time much work has been done on the connexion between fatty acids and cancer, but Beatson's special treatment based upon his own theory received no general endorsement.

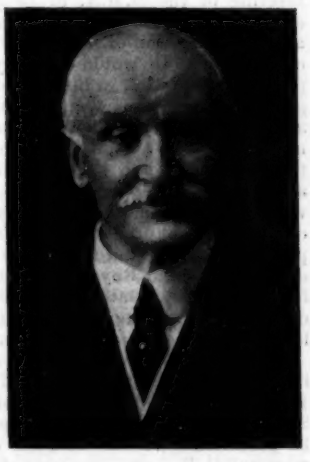
As quite a young man Sir George Beatson was interested in military affairs. He was an officer in the old Volunteers, and had an administrative medical post with the Territorial Army, during the formation of which he was constantly consulted, and was finally appointed administrator of the Lowland Division. At the same time he began to take an active part in Red Cross organisation, and at the outbreak of the South African war was largely responsible for the fact that the Scottish National Red Cross Hospital of 520 beds played so prominent a part. For these services he was gazetted C.B. in 1902, and five years later K.C.B., receiving also the V.D. and the decoration of the Order of St. John of Jerusalem. In the European war he played a similarly important rôle. He acted as chairman of the Scottish Branch of the Red Cross Society throughout the struggle, did invaluable work in that capacity, and received official thanks, the order of K.B.E. and the decoration of the Legion of Honour, and the Crown of Belgium. It will be remembered that the Scottish Red Cross Society was responsible for the construction of the famous bungalow hospital at Bellahouston, where 1200 beds ministered during the war to the needs of 15,000 sick and wounded, while its construction cost only £100,000.

By the death of Sir George Beatson we have lost a great medical organiser and one whose work had a special influence during critical situations in national affairs.

THEOPHILUS BULKELEY HYSLOP, M.D., M.R.C.P., F.R.S. Edin.

LATE PHYSICIAN-SUPERINTENDENT, THE BETHLEM ROYAL HOSPITAL

THE death occurred on Sunday, Feb. 12th, of Dr. T. B. Hyslop, the well-known psychiatrist, in a nursing home after a prolonged illness at the age of 69. He received his medical education at the University of Edinburgh where he graduated M.B., C.M. in 1886, and proceeded to the M.D. in 1890, being already an M.R.C.P. Edin. He early elected to specialise in medical psychology; he studied his subject on the continent, especially in Paris, and at the age of 25 became assistant medical officer at the Bethlem Hospital. He was Gaskell scholar of the Royal Medico-Psychological Association, and took a prominent part in educational questions connected with psychology, and was for a time senior examiner of the Association. In 1909 Hyslop was appointed physician-superintendent to Bethlem, while he was also at different times lecturer on psychological medicine at St. Mary's Hospital medical school and at the London School of Medicine for Women. As a lecturer he was a great success, for his well-informed teaching abounded with witty illustrations of the various phases of his subject, while his great versatility made it easy for him to vary his academic discourses with references to sport and art.



DR. T. B. HYSLOP

[Photograph by Russell

Hyslop wrote a text-book on mental physiology

which appeared in 1896, while he was assistant at Bethlem. The work was intended especially for candidates for the M.D. degree at the University of London, but it was not merely a text-book, and the author was a young man to take up so strong a position as he did on many points then under discussion; and much of what he then arrived at still remains on debatable ground. The chapters, however, on the localisation of the mental faculties and on memory were excellent, and the work would have well repaid reissue, with modifications and additions conforming to added experience and a broadening of accepted knowledge. In 1925 his interesting volume on the problems of insanity entitled "The Borderland" appeared, and in this he was quick to seize the opportunity of publishing varied and heterogeneous conclusions on the aspects of society following the upheaval of the war. The book had undoubtedly brilliant passages, but the author's numerous interests and accomplishments compelled him to embody a greater variety of subject matter than was good for any reader's digestion, while his pessimistic views of the future of the British race did not receive from him the kind of support which would be expected from a well-known man of science. His last published work, quite a small volume entitled "Mental Handicaps in Art," conveyed within less than 100 pages much æsthetic information, useful criticism, and sound philosophy. Writing on the oft-debated question of how far genius and madness are akin, he uttered words of warning that were quite timely, pointing out that, while degeneracy is often productive of bad art, bad art is not an invariable outcome of degeneracy, but may result from defective education, failures in observation and technique, or from imposture. He contributed also to Tuke's "Dictionary of Psychological Medicine," and to the "Encyclopædia Medica," while in the second edition of Allbutt and Rolleston's "System of Medicine" he was the author of the article upon Alcoholic Insanity.

Hyslop's position as a psychiatrist was recognised by his colleagues. He served as president of the section of psychological medicine at the annual meeting of the B.M.A. in 1910, and was president at one time of the Society for the Study of Inebriety, and of the section of psychiatry of the Royal Society of Medicine. He would certainly have made a greater position for himself in his specialty if his multifarious gifts had not somewhat obscured his professional attainments. For he was a remarkably accomplished man. He was a really good painter, a member of the London Sketch Club, and a recurring exhibitor at the Royal Academy and the Royal Institute. He was a skilled musician, both as instrumentalist and composer; his orchestral works have been publicly played in many places, and he acted for a time as examiner for the Royal Academy of Music. He was far above the amateur level as a billiard player, a considerable athlete, an all-round cricketer, a good lawn tennis player, and had been a "plus" golfer.

From an account sent to us by a friend and colleague it could be seen that the above list is not exhaustive. Hyslop published, for example, an imitation of Swift's "Laputa," satirising present-day customs; he produced a volume of verse showing considerable metrical skill; and one year, for the annual entertainment of Bethlem Hospital, he produced a very amusing play based on one of Mr. T. S. Clouston's well-known novels. Dr. Hyslop's friend sums up his notes with the regret that a man of such energy and brilliancy should be unable to concentrate, and from the record above it must be concluded that the criticism may be just. None the less, though by a dissipation of energy Hyslop may have lost eminence along one line, the loss was counterbalanced by the gains of his remarkable adaptability.

The close of this full life was saddened by the development of a nervous affection, traceable possibly to the shock of certain air raids during the war. He leaves a widow but no children.

RUSSELL COOMBE, F.R.C.S. Eng.

Mr. Russell Coombe, a surgeon well known throughout the south-west of England, died suddenly at his home, St. Germans Lodge, Exeter, on Feb. 13th.

Russell Coombe received his education at Caius College, Cambridge, and took honours in the Natural Science Tripos in 1882. He proceeded from Cambridge to St. George's Hospital, qualified as M.R.C.S. in 1886, and held several junior appointments. He was for a period house surgeon to the Devon and Exeter Hospital, and in 1888 took the F.R.C.S. Eng., when he started in surgical practice at Exeter. He was surgeon to the Exeter Dispensary and the Devon and Exeter Dental Hospital, and rapidly made a reputation as a competent and dexterous operator. He became surgeon to the Victoria Hospital, Sidmouth, and to institutions and cottage hospitals in Axminster, Budleigh Salterton, Chard, and Ottery St. Mary, and was for many years one of the busiest operating surgeons in that part of the country. On the outbreak of war he was attached to Netley Hospital as an operating surgeon with the rank of Major, R.A.M.C. He was the first chairman of the National Health Insurance local medical committee for Devonshire, and proved himself a wise negotiator in circumstances often difficult and delicate. He was for many years secretary of the south-western branch of the British Medical Association, doing admirable work for the Association also as honorary secretary at the annual meeting in Exeter, and as chairman of the central organisation committee. He wrote very little, but two or three clinical communications made to the *Annals of Surgery* and to *The Lancet* were evidence of the practical nature of his work.

Dr. Alfred Cox writes: "The death of Russell Coombe deprives the south-west of an outstanding personality. For a long period he was one of the busiest surgeons in that part of the country, and though for the past few years he had been out of professional practice he never ceased to take an active interest in the affairs of his profession.

"My personal acquaintance with him began at the Exeter meeting of the British Medical Association in 1907. He was the honorary secretary of a most successful meeting, and carried through the administrative arrangements with characteristic thoroughness. It was in that year that he began his long official connexion with the Association as secretary of the south-western branch—a position he held until 1918. He represented the branch on the council of the Association from 1915 to 1922, and from 1915 to 1921 he was chairman of the central organisation committee at a time when the work of that committee was extremely arduous; this proved an excellent appointment, for Coombe was courteous, firm, and painstaking. He took a special interest in the propaganda of the Association amongst medical students and newly qualified practitioners, and in the historical aspect of the Association. He was the author of the 'Short History' which was of great service when the Association published the historical volume in connexion with its centenary meeting, and one of the

last acts of his busy life was to write an account of the south-western branch which he had served so faithfully. He was a vice-president of the section of surgery at the annual meeting of the Association in 1908, and few things in life gave him greater pleasure than his election as a vice-president of the Association at the centenary meeting.

"Coombe's intense interest in Devonshire was always being manifested. When I stayed with him a couple of months ago he was full of talk about the eighth centenary of Exeter cathedral, of which building he seemed to know every stone; and ecclesiastical architecture was one of the great hobbies of his life. He was a fine example of the man who, though keenly interested in the technical side of his work which kept him very busy, could always make time to take an active part in those movements which exist for protecting the interests of the profession in general. His loss will be mourned by all who had the privilege of working with him, and particularly by his colleagues in the south-west who continually made demands on his services and never in vain."

WILLIAM MITCHELL, M.B. Edin.

THE death of Dr. Mitchell at his home in Bradford at the age of 67 adds to the toll of those radiologists who suffered severely from X ray injuries contracted in the early days of the specialty. An Aberdeenshire man, he went to school in Edinburgh and then spent six years in America engaged in banking. Returning to Scotland he graduated in medicine in 1894, and two years later settled in Bradford as a general practitioner. From 1910 onwards he devoted himself solely to radiology. At the Bradford Royal Infirmary he inaugurated the X ray department and maintained a high standard of efficiency and service for 25 years. More recently he was appointed radiologist to St. Luke's municipal hospital, and here again he had the responsibility of starting a new department. "He possessed in striking degree," writes a colleague, "the characteristics of the northern Scot, the grit and independence, and tenacity of purpose, and was a man of general culture and widespread interests. But most of all his friends will remember him for the lovable personal qualities that lay beneath the surface, a generosity which gave liberally to those who needed help, a shrewd understanding of men and things, and an unusual capacity for loyal friendship." Dr. Mitchell was for many years a member of the council of the British Institute of Radiology, and had presided over the Bradford Medico-Chirurgical Society and the local division of the British Medical Association. He was also a prominent freemason.

He leaves a widow and four married daughters.

VICTOR CORBOULD, M.D. Brux., M.R.C.S.

THE death occurred of Dr. Victor Corbould at Colcherne-court, London, on Wednesday, Feb. 15th, in his sixty-seventh year.

Victor Albert Louis Edward Corbould was the elder surviving son of Edward Henry Corbould, R.I., tutor in drawing and painting to Queen Victoria and her children for 20 years, and a grandson of Henry Corbould, F.S.A., the artist who designed several of our first postage stamps. He was the descendant of an old family of artists who came from Suffolk to London two centuries ago and set up in Lombard-street as artist-engravers, goldsmiths, and bankers. Victor Corbould's mother, Annie Middleton Wilson, was also of an artistic family, being the niece of John Martin, the well-known painter of "Belshazzar's Feast." He was a godson of H.R.H. Princess Louise, Duchess of Argyll, and was educated at Epsom College and Charing Cross Hospital, where he was an entrance scholar. He qualified in 1894, taking the English double diploma and the Brussels M.D., and was for 12 years anæsthetist to the hospital, while he held the same appointment at the Victoria Hospital for Children, and during the war to the Michie Red Cross Hospital. He was attached to the Kensington Dispensary, and medical adviser to the Kensington branch of the Charity Organisation Society. For over 30 years he practised in Victoria-road, Kensington.

Victor Corbould, as might have been anticipated from his early environment, took a great interest in all branches of art, and despite professional demands found time to become a sound painter. He was also a prominent freemason. He married in 1896 Agnes Maud Mary, daughter of the Rev. H. C. Wyatt—"Sister Maud" at Charing Cross Hospital—who predeceased him.

Dr. RHYS THOMAS LEWIS, who died on Jan. 29th from influenza at the age of 38, went to Swansea eight years ago to join Dr. J. Lloyd Davies in general practice. Two years later he took over the practice on his own account, and succeeded in making it one of the largest in South Wales. His medical education started at Cardiff, whence he gained the Goldsmiths' entrance exhibition at University College Hospital, London, in 1914. Later he held several resident posts at this hospital, his last appointment being that of Harker Smith's scholar in radium. During the war he served with a captain's commission at Basra and Bagdad. After settling in Swansea he became assistant physician to the Swansea General and Eye Hospital, and consulting physician to the Gorseinon General Hospital. A colleague writes of him that he was clearly marked out for a brilliant future and a large consulting practice throughout South Wales. He leaves a widow and two young children.

SUCCESS OF CONTRIBUTORY SCHEMES. — The Bristol Medical Institutions Contributory Scheme has just completed its sixth year with an income of just over £14,000, which forms a record. The income of the first year was £1300; during the six years £50,000 has been contributed.—A record has also been made by the Banbury and District Workpeople's Hospital Fund, which last year handed over £2850, a substantial increase.—During the first year of the Stamford Infirmary Scheme 10,000 contributors were enrolled and a total income of £3174 obtained.

HOSPITALS AND ROAD ACCIDENTS. — Mr. Charles M. Power last week read a paper on this subject at a meeting of the Incorporated Association of Hospital Officers. Pointing out that the clause in the Road Traffic Act, 1930, enables hospitals to recover costs from insurance companies only when the motorist involved is found liable for the accident and when the injured party is an in-patient, Mr. Power produced figures to show that the claims of the hospitals were successful in less than 35 per cent. of the road traffic accidents treated by them in the wards, while they are precluded from recovering the cost of treatment of the thousands of motor accident injuries treated in the surgeries. Figures for 18 hospitals showed that in 1932 the cost of treating 2692 in-patients was £24,048, whereas the costs recovered from the insurance companies were only £5955. Among other constructive proposals, Mr. Power suggests that every hospital should follow up its claim for costs of maintenance, and should accept no compromise where liability is acknowledged or implied, that the hospitals should endeavour to come to a better understanding with the insurance companies, and that a fixed rate of charge for maintenance for each group of hospitals should be arranged with the companies.

PARLIAMENTARY INTELLIGENCE

NOTES ON CURRENT TOPICS

Accused Persons and Medical Certificates

ON Monday, Feb. 20th, the House of Commons went into Committee of Supply on Civil Service Estimates. Captain BOURNE, Deputy-Chairman of Committees, was in the chair.

On a supplementary vote of £7500 for the salaries and expenses of the Lord Advocate's Department and other law charges in Scotland,

Mr. HORE-BELISHA (Financial Secretary to the Treasury) said that this increased expenditure was in regard to criminal prosecutions in Scotland. It arose from the Scottish Amalgamated Silks case.

Mr. MCGOVERN said that one of the circumstances which arose in connexion with this Amalgamated Silks case was that Mr. John Gardiner, on the production of a medical certificate, was discharged. It was alleged that prominent members of the House of Commons did a considerable amount of interviewing and appealing in connexion with Mr. Gardiner when he was released. He was 57 years of age, and to his (Mr. McGovern's) knowledge had fairly decent health. Two other persons were also discharged. The accused were sent for trial and one man was discharged from the dock—again on the production of a medical certificate. It seemed to him that the judicial régime in Scotland at the moment was pursuing a policy of recognising the production of medical certificates in cases of people of substance and wealth, and that such persons were being discharged fairly readily on production of certificates of ill-health. The result of this great trial, involving about a dozen people, was watered down by the production of medical certificates and in various ways. He wanted to know if the production of medical certificates was part and parcel of the policy being pursued by the Lord Advocate and the Scottish Office in order to allow people of substance to evade their responsibilities.

Mr. NORMAND (Solicitor-General for Scotland) said he regretted that the Lord Advocate was prevented by illness from being present to reply to the attack which had been made upon him. For the suggestion that there had been some differentiation in favour of those who were well-to-do, and that others who were less well-off had been placed on trial, there was no shadow of reasonable ground whatever. It would be impossible for one to conduct the criminal administration of the law in Scotland if it were to be supposed that everybody originally charged must be brought to trial. He repudiated in the most emphatic terms the suggestion that the administration of justice in Scotland was open to suspicion by any reasonable man on the assumption that a man who was well-off would receive more favourable treatment than anybody else.

Mr. BUCHANAN said that he believed sincerely that the Lord Advocate's Department, presided over by the present Lord Advocate in Scotland, was corrupt at the present time. As soon as the Lord Advocate returned he would be prepared to face him in the House of Commons and say that his Department was corrupt, and that he himself was not capable of conducting his Department in a way that any business man would allow his department to be conducted. John Gardiner was liberated on the grounds of ill-health, and the evidence of that was a doctor's certificate. But the doctor was not examined on oath as to its correctness or otherwise. The certificate was sent to the Lord Advocate who was the sole custodian.

Mr. ALBERT RUSSELL: Does the hon. Member accuse the doctor of giving a false certificate?

Mr. BUCHANAN: No, but I say that he should go into the witness-box and be examined.

Mr. RUSSELL: A doctor gives a certificate on his soul and conscience, and he stakes his reputation on it.

Mr. BUCHANAN said that even if the doctor did that he had his duties as a citizen, and he should be examined on his medical evidence. When a doctor gave a certificate under National Health Insurance that a man was sick, he did it upon his soul and conscience, but it was not taken as final, and the man had to go to the regional doctor.

Mr. SKELTON (Under Secretary of State for Scotland) said it was most unfortunate that these attacks upon the professional conduct of the Lord Advocate should be made in his absence through illness. He did not propose to reply to them, but he most emphatically registered his protest.

After further debate,

The supplementary vote was agreed to by 178 votes to 2.

HOUSE OF COMMONS

THURSDAY, FEB. 16TH

The Children Act, 1932

Mr. LEES-JONES asked the Home Secretary when the whole of the Children Act, 1932, would be put into operation.—Sir J. GILMOUR replied: It was my original intention to bring this Act into operation on April 1st, but I hope to be able to introduce shortly a Bill to consolidate this Act with other enactments relating to children and young persons. It will be greatly for the convenience of those responsible for the administration of these Acts that the provisions of the Act of 1932 shall not come into force until the Consolidation Bill has passed into law. This may mean a short delay, but I intend that these provisions shall be brought into force in any case before the Summer Recess.

Privacy at an Inquest

Mr. COCKS asked the Home Secretary whether he was aware of the anxiety concerning the circumstances of the death by poisoning on Dec. 25th at St. Stephen's Hospital, Chelsea, of Madame Zeinep Vlora, an Albanian subject; whether permission was granted by his department to dispense with the usual public coroner's inquest, and, if so, for what reason and by whom was the request made; for what reason the death of Madame Vlora was kept secret for a month; whether any report on the case was made by the police; whether he could state its nature; and whether he would make a statement with a view to relieving the anxiety aroused by this affair.—Sir JOHN GILMOUR replied: I am not aware of the existence of any anxiety in this matter. Questions of diplomatic privilege arose in connexion with the attendance of witnesses at this inquest, and it was as a result of this being communicated to the coroner that, in the exercise of his discretion, he decided not to hold the inquest in public. The death was registered in the ordinary way on the day after the inquest.

Open-air Nursery Schools

Viscountess ASTOR asked the Parliamentary Secretary to the Board of Education the total number of children who entered school at the age of 5 last year after attending open-air nursery schools; and what proportion of these were free from mental or physical defects.—Mr. HERWALD RAMSBOTHAM replied: I am afraid no information is available which would enable me to give the figures in question, but I am aware that certain data may be obtained by individual authorities in the course of their administration of the School Medical Service, and I should be happy to send the noble lady any information on the subject which may be available.

Viscountess ASTOR: Is it not true that of the children entering in the ordinary way 37 per cent. are physically defective in some way or other, while of those who come from open-air nursery schools only 7 per cent. have any physical defect; and would it not be a very good thing for the Government to go on encouraging open-air nursery schools during this terrible depression?

No further answer was given.

Economic Depression and Public Health

Mr. RHYS DAVIES asked the Parliamentary Secretary to the Board of Education whether his attention had been called to the memorandum prepared by the health section of the League of Nations on economic depression and public health, and to their inquiry into the effects of the crisis on public health; and whether he would institute a comprehensive inquiry on these lines in Great Britain in respect of children of school age, with a view to the publication

of the results as soon as might be for the guidance of His Majesty's Government and the information of the health committee of the League.—Mr. H. RAMSBOTHAM replied: My noble friend is aware of the memorandum and inquiry in question. The effect of the economic depression on the health of school-children is being carefully watched by the Board and the local education authorities, as part of the ordinary work of the School Medical Service, and special measures to safeguard the health of the children are being taken in the areas where the depression is most acute. As stated in the latest annual report of the Board's Chief Medical Officer, the depressed state of industry does not appear to have exerted any measurable physical ill-health upon the child population. In these circumstances my noble friend does not think it necessary to institute a comprehensive inquiry on the lines suggested.

In reply to a similar question addressed by Mr. GORDON MACDONALD to the Minister of Health, Sir E. HILTON YOUNG replied: I am aware of the memorandum and inquiry. I do not think it necessary to attempt to supplement by means of another inquiry such as is suggested in the question, which might be both prolonged and costly, the substantial body of information available from official and other sources as to conditions in England and Wales which has, as the memorandum referred to shows, already been communicated to the health section of the League of Nations.

Maternity and Child Welfare

Mr. HICKS asked the Minister of Health whether he was aware that the maternity and child welfare centre in Cumming-street, Finsbury, had been given up, and the municipal midwifery scheme had been abolished on grounds of economy; and whether, in view of his pledges to set the maternal mortality-rate in the forefront of national health services, he would inquire into this reduction of the services of Finsbury.—Sir E. HILTON YOUNG replied: I am informed that the facts are that early last year the borough council decided not to proceed with the erection of a proposed maternity and child welfare centre, and to substitute for the services of the municipal midwives a midwifery service provided by arrangement with the hospitals and nursing associations which serve the borough. I am not aware that there has been any reduction of maternity and child welfare services in this borough, but I have arranged that in ordinary course a review should be made of the working of the midwifery scheme recently instituted.

Changing Ambulance at Boundaries

Mr. DORAN asked the Minister of Health if he was aware of the risks involved by the practice of transferring sick patients from one hospital ambulance to another at the various metropolitan and other town boundaries throughout the country; if he would issue a circular to metropolitan and other authorities asking them to discontinue the practice and establish a through service between the hospital and the patient's home; and, if in the absence of compliance with this request, he would introduce a Bill to sanction measures for the enforcement of such a service throughout the country.—Sir E. HILTON YOUNG replied: The working of ambulance arrangements is a matter for the responsible local and hospital authorities, and such arrangements throughout the country as a whole naturally vary in different districts. I shall be glad to consider any evidence with which my hon. friend may desire to furnish me as to injurious effects resulting from existing practices.

Impure Imported Tinned Foods

Sir MERVYN MANNINGHAM-BULLER asked the Minister of Health whether his attention had been drawn to the recent discovery by a county analyst of harmful bacteria in imported tins of Russian herrings and in condensed milk; and whether periodical analysis of such imported goods were undertaken by his department, or what steps were taken to check the imports of impure tinned goods.—Sir E. HILTON YOUNG replied: I understand that certain brands of herrings and condensed milk have recently come under suspicion, and I am making urgent inquiries into the matter. In answer to the second part of the question, imported foods are examined by the local authorities at the ports of entry, and together with home produced articles also by inland local authorities.

Mr. DREWE asked the Minister of Healther whether, in view of the fact that recent samples of Russian condensed milk had been found to contain staphylococci, he would prevent the importation of Russian condensed milk in the future.—Sir E. HILTON YOUNG replied: I understand that certain brands of imported condensed milk have recently come under suspicion, and I am making urgent inquiries into the matter. I may add that the presence of staphylococci in condensed milk does not necessarily make it injurious to health.

Death from Generalised Vaccinia

Mr. GROVES asked the Minister of Health whether his attention had been drawn to the inquest held at Liverpool on Jan. 20th upon the body of an infant named Donald Hardy, whose death was attributed by the verdict of the jury to vaccination; and whether his medical officers had any explanation to offer as to why Government lymph, which was used in this case, should have led to this result.—Sir E. HILTON YOUNG replied: Yes, Sir. I have made inquiries into this case and I am advised that there is no doubt that this child died from generalised vaccinia, a very rare sequel of vaccination, which is explicable only on the assumption of a peculiar susceptibility of the individual to the vaccine. The same batch of lymph had been used for at least 1200 other vaccinations without ill-effect.

MONDAY, FEB. 20TH

Notification of Leprosy

Major PROCTER asked the Minister of Health why leprosy had not been made a notifiable disease; and if he was prepared to make it notifiable.—Mr. SHAKESPEARE (Parliamentary Secretary to the Ministry of Health) replied: My right hon. friend is advised that in the conditions which exist in this country leprosy is very unlikely to be conveyed from one person to another. The number of imported cases is very small, and no instance is known in which infection has resulted from contact with them. My right hon. friend is advised accordingly that compulsory notification is not required in the interests of the public health.

TUESDAY, FEB. 21ST

Health Insurance Benefit in Scotland

Mr. DUNCAN GRAHAM asked the Secretary of State for Scotland if he was aware that regional medical officers in the employment of the Department of Health were in the habit of recommending disallowance of health insurance benefit in cases of persons who had not fully recovered from their illness but who were described as being fit for some form of light employment; and if he would state the number of persons whose benefit had been stopped on this ground during the years 1931 and 1932.—Sir GODFREY COLLINS replied: It is not the function of the regional medical officers of the Department of Health for Scotland to make any recommendation with regard to the stoppage of National Health Insurance benefit in the case of insured persons who have been examined by them, and in no case do they do so. The duty of these officers is to furnish the insured person's approved society with an opinion as to his capacity for work. The decision as to the continuance or stoppage of benefit rests with the approved society from whose decision the insured person has a right of appeal. I have no information regarding the matter referred to in the latter part of the question.

Mr. DUNCAN GRAHAM asked the Secretary for Scotland whether he was aware that a letter had been sent to the insurance committee of the burgh of Glasgow, from the Department of Health for Scotland, to the effect that medical practitioners were signing certificates entitling persons to payment of health insurance benefit who were sufficiently recovered from their incapacity to enable them to resume their ordinary employment; whether this letter was issued by his authority; and, if so, would he state the grounds upon which it was sent.—Sir GODFREY COLLINS replied: In the ordinary course of administration an annual circular letter on the subject of the issue of certificates of incapacity for work to insured persons was recently sent by the Department of Health for Scotland to each insurance committee in Scotland. With the letter were enclosed statistics showing (1) the extent to which such certificates had been issued during the year ended June 30th, 1932, by each insurance practitioner in the insurance committee's area, and (2) the results of re-examinations by the Department's regional medical officers of insured persons to whom certificates of incapacity had been issued. The letter, of which I am sending a copy to the hon. Member, asked insurance committees to inquire into the problems presented by the statistics both as regards their area as a whole, and in respect of individual practices, and called attention to the importance of correct certification and to the unfortunate results accruing from laxity in this respect.

ROYAL DEVON AND EXETER HOSPITAL.—The annual report states that at the end of September last 17 cases of fractured femur, the result of road accidents, were being treated, and that the average stay of these patients was between three and four months. The average stay of the 3422 in-patients was 20½ days, and the average cost per occupied bed was £129 14*s.* 7*d.* Out-patients made 57,700 attendances.

MEDICAL NEWS

University of Oxford

In a congregation held on Feb. 11th the degree of Bachelor of Medicine was conferred upon Charles Hilton Fagge.

University of London

On Tuesday, March 14th, Dr. C. Bruce Perry will read a lecture, which was prepared by the late Dr. Carey Coombs, on Thirty Years' Progress in the Study of Rheumatic Heart Disease. The lecture will be given at 5.30 P.M., at University College Hospital medical school, Gower-street, W.C., and Dr. F. J. Poynton will take the chair.

Royal College of Surgeons in Ireland

The Mary Louisa Montgomery lecture was delivered in the hall of the college on Feb. 17th by Mr. Maurice H. Whiting, who took as his subject Modern Developments in Cataract Extraction.

Gresham College

Four lectures on Health and Industry will be given by Sir George Newman at this college, Basinghall-street, London, E.C., at 6 P.M. on Feb. 28th and March 1st, 2nd, and 3rd. Admission without ticket.

A High Mental Recovery-rate

Reporting on his annual visit to the Stirling District Mental Hospital at Larbert, Dr. H. C. Marr, senior commissioner of the Scottish Board of Control, states that 76 patients were discharged as cured, a recovery-rate of 53·9 per cent., which is much above the average in Scottish mental hospitals. Dr. Marr suggests that the rate may have some relation to the use of physical therapy.

International Congress of Hydrology

The 14th International Congress of Hydrology, Climatology, and Medical Geology will be held at Toulouse from Oct. 4th to 8th, under the presidency of Prof. Paul Sabatier and Prof. E. Abelous. The subjects of discussion will be the thermo-mineral waters of the French Pyrenees and their geological grouping; the rare gases of mineral waters; climatic cures and pulmonary tuberculosis; indications for bracing cures for children; primary non-suppurative infections of the nervous system; utilisation of the French spas by the army medical corps; and the legal control and survey of mineral waters. Sir James Purves-Stewart will introduce the English report on nervous infections. Further particulars of the congress may be had from Prof. Serr, hon. general secretary of the congress, at the Faculté de Médecine, Toulouse, Haute Garonne, France.

Moorfields Hospital Dinner

The annual dinner of past and present students of the London Royal Ophthalmic (Moorfields) Hospital was held at the Langham Hotel on Feb. 9th, with Sir Arnold Lawson in the chair.

Mr. Charles Goulden, dean of the medical school, stated that the school was in a flourishing state. During the year 1931–32, 117 students had attended the practice of the hospital, and of these 67 were new students. A total of 328 lectures had been given. The school still prepared by far the largest proportion of students who sat for the diploma of ophthalmological medicine and surgery. During the past year, of 31 candidates who were successful in the first part of the examination for this diploma, 21 received their instruction at Moorfields, and of the 31 who were successful in the second part, 25 were students of the hospital. Rebuilding of the out-patients' department and the medical school will begin in March, and when it is completed the facilities for clinical instruction and laboratory teaching will be greatly improved.

Radium in West Sussex

On behalf of the Sussex council of the British Empire Cancer Campaign, Lord Leconfield, Lord-Lieutenant of the county, at a meeting at Chichester on Jan. 20th, handed over a gift of 75 mg. of radium for the Royal West Sussex Hospital. Fifteen months ago a campaign was launched whose objects were: (1) the provision of radium for the treatment of cases in West Sussex; (2) a supply for East Sussex; and (3) the establishment of a deep ray therapy plant in a central place in the county. The first object has now been achieved by the distribution of over 75,000 leaflets and the collection of over £4000. In receiving the gift the Mayor of Chichester said that heretofore the nearest place where radium treatment could be obtained was Southampton, and travelling north from Chichester there was nothing to be found between it and London. The hospital had possessed since 1930 some 36 mg. of radium, the cost of which was £513.

London Jewish Hospital

A surgical ward has been given to this hospital by Mrs. Dickman. It will be known as "The Esther Mohnblatt Ward"—from the donor's maiden name.

Heating and Ventilation

A paper on Recent Developments in the Warming and Ventilation of Buildings will be read by Mr. J. L. Musgrave, past president of the Institution of Heating and Ventilating Engineers, at a meeting of the Royal Society of Arts which will be held at its premises in John-street, Adelphi, London, W.C., at 8 P.M. on Wednesday, March 8th.

Enlargement of Sale War Memorial Hospital

Last week Mr. Cyril Atkinson, M.P. for Altrincham, opened a new wing of this hospital containing 20 beds entirely for women. The ground floor is occupied by a maternity ward of eight beds, one private ward, and the necessary labour ward, bathrooms, and kitchen. On the first floor there are an eight-bedded ward, three private wards, and a theatre. The old building has been so rearranged as to afford a children's ward of six beds.

Waltham Joint Hospital Inquiry

The result of the Ministry of Health's inquiry into complaints regarding the deaths of two boys in the Waltham Abbey Infectious Diseases Hospital, and into its general administration, is completely to exonerate the institution. It is found in the case of one boy that treatment was unsuccessful because of the patient's very serious condition when he had only partially recovered from scarlet fever. The other boy "died from hæmorrhage following scarlet fever, which hæmorrhage could not have been foreseen or prevented, and was not caused by a previous traumatic injury," as had been suggested. In reply to the complaint of the Chingford urban district council that the number of "return" cases is abnormal, it is pointed out that in 1931 there was a larger number than usual on account of the heavy incidence of scarlet fever. The Ministry promises, however, to make suggestions calculated to minimise the number of return cases. In the meantime it is suggested that in times of pressure medical officers should advise isolation in hospital only of patients who cannot adequately be treated at home.

Medical Diary

Information to be included in this column should reach us in proper form on Tuesday, and cannot appear if it reaches us later than the first post on Wednesday morning.

SOCIETIES

ROYAL SOCIETY OF MEDICINE, 1, Wimpole-street, W.

MONDAY, Feb. 27th.—8 P.M., ODONTOLOGY. Mr. F. N. Doubleday: Evidence Regarding the Different Types of Periodontal Disease.

WEDNESDAY, March 1st.—5 P.M., HISTORY OF MEDICINE. Papers: Mr. James Kemble: The History of Occupational Diseases. Dr. E. Stolkind: The History of Allergy and Allergic Diseases (Bronchial Asthma, Hay-fever, Migraine, &c.).

THURSDAY.—8.15 P.M., TROPICAL DISEASES AND PARASITOLOGY. Discussion: The Diagnosis of Chronic Diarrhœas. Opening papers: Dr. Robert Hutchison: The Differential Diagnosis of the Chronic Non-tropical Diarrhœas. Dr. P. H. Manson-Bahr: The Diagnosis of Chronic Diarrhœas as Seen in the Tropics. Mr. Lionel E. C. Norbury: Chronic Diarrhœa from the Surgical Aspect. Other speakers will take part. Members of the Section of Medicine are specially invited to attend.

FRIDAY.—4.45 P.M., LARYNGOLOGY. (Cases at 4 P.M.) Discussion: Acute and Chronic Inflammatory Disorders of the Ethmoidal and Sphenoidal Sinuses. Openers: Prof. Lemaitre (Paris), Dr. Aubin (Paris), and Mr. A. Lowndes Yates. 8.30 P.M., ANÆSTHETICS. Discussion: Anæsthesia in Intracranial Surgery. Openers: Dr. Norman Dott, Dr. Z. Mennell, Dr. J. F. Ryan, and Dr. J. H. T. Challis. Other speakers will take part.

MEDICAL SOCIETY OF LONDON, 11, Chandos-street, Cavendish-square, W.

MONDAY, Feb. 27th.—8.30 P.M., Discussion on the Increased Frequency of Fevers of the Undulant Type in Non-tropical Countries and its Relationship to Infection by Cow's Milk; to be introduced by Dr. P. H. Manson-Bahr, Prof. G. S. Wilson, and Dr. Theodore Thompson.

WEDNESDAY, March 1st.—9 P.M., Mr. V. Zachary Cope: Pathology of Acute Abdominal Disease. (Second Lettsomian lecture.)

NORTH-WEST LONDON MEDICAL SOCIETY.
TUESDAY, Feb. 28th.—9.30 P.M. (at the Willesden Constitutional Club House, 110, Walm-lane, N.W.), Dr. J. Stanley White: Recent Advances in Biological Therapy.

HUNTERIAN SOCIETY.
MONDAY, Feb. 27th.—9 P.M. (in the London Mansion House), Sir T. Crisp English: The Language of Facts. (Hunterian oration.)

WEST LONDON MEDICO-CHIRURGICAL SOCIETY.
FRIDAY, March 3rd.—8 P.M. (at West London Hospital, Hammersmith-road, W.), Clinical and Pathological Meeting.

LONDON ASSOCIATION OF THE MEDICAL WOMEN'S FEDERATION.
TUESDAY, Feb. 28th.—8.30 P.M. (at B.M.A. House, Tavistock-square, W.C.), Miss F. M. Huxley: American Experience.

LECTURES, ADDRESSES, DEMONSTRATIONS, &c.

ROYAL COLLEGE OF PHYSICIANS, Pall Mall East, S.W.
TUESDAY, Feb. 28th.—5 P.M., Dr. R. Cruickshank: Pneumococcal Infections. (Second Milroy lecture.)
THURSDAY, March 2nd.—5 P.M. (Last Milroy lecture).

FELLOWSHIP OF MEDICINE AND POST-GRADUATE MEDICAL ASSOCIATION, 1, Wimpole-street, W.
MONDAY, Feb. 27th, to SATURDAY, March 4th.—MEDICAL SOCIETY OF LONDON, 11, Chandos-street, Cavendish-square. Practical Problems in Medicine and Surgery. Tues., lecture by Mr. J. P Lockhart-Mummery on the Causes and Treatment of Incontinent Anus, at 4 P.M. (Free to Members and Associates of the Fellowship.)—NATIONAL TEMPERANCE HOSPITAL, Hampstead-road, N.W. Evening M.R.C.P. Course. Mon. and Fri., at 8 P.M.—PRINCE OF WALES'S HOSPITAL, Tottenham, N. Post-graduate Course in Medicine, Surgery, and the Specialties. All day instruction.—HOSPITAL FOR CONSUMPTION, Brompton, S.W. Post-graduate Course in Practical Pathology dealing with Laboratory Methods and the Interpretation of Results. Mon. and Thurs., 11.30 A.M. to 1 P.M.—NEW GENERAL HOSPITAL, Southend-on-Sea. Week-end Course of Practical Demonstrations in General Medicine and Surgery. Sat. and Sun., all day.—(Courses, &c., open only to Members and Associates of the Fellowship of Medicine.)

ST. MARK'S HOSPITAL, City-road, E.C.
THURSDAY, March 2nd.—4 P.M., Dr. Norman Henderson: The Value of the Opaque Enema in the X Ray Diagnosis of Pathological States of the Large Intestine.

CENTRAL LONDON THROAT, NOSE, AND EAR HOSPITAL, Gray's Inn-road, W.C.
FRIDAY, March 3rd.—4 P.M., Mr. W. A. Mill: The Diagnosis of Acute Mastoiditis.

SOUTH-WEST LONDON POST-GRADUATE ASSOCIATION, St. James's Hospital, Ouseley-road, Balham, S.W.
WEDNESDAY, March 1st.—4 P.M., Dr. H. C. Cameron: Demonstration of Children's Ailments.

ROYAL NORTHERN GROUP OF HOSPITALS.
WEDNESDAY, March 1st.—3.15 P.M. (at the Royal Chest Hospital, City-road), Dr. J. Maxwell: Empyema.

LONDON SCHOOL OF DERMATOLOGY, St. John's Hospital, 49, Leicester-square, W.C.
TUESDAY, Feb. 28th, and THURSDAY, March 2nd.—5 P.M., Dr. W. Griffith: Eczema. (Chesterfield lecture.)

ST. PETER'S HOSPITAL FOR STONE, Henrietta-street, W.C.
WEDNESDAY, March 1st.—3 P.M., Mr. A. C. Morson: Relation of Genito-urinary Symptoms to Diseases of the Nervous System.

NATIONAL HOSPITAL, Queen-square, W.C.
MONDAY, Feb. 27th.—2 P.M., Dr. Riddoch: Out-patient Clinic. 3.30 P.M., Dr. Hinds Howell: Vascular Diseases of the Nervous System.
TUESDAY.—2 P.M., Dr. Walshe: Out-patient Clinic. 3.30 P.M., Dr. Martin: Demyelinating Diseases of the Nervous System.
WEDNESDAY, March 1st.—2 P.M., Dr. Martin: Out-patient Clinic. 3.30 P.M., Dr. James Collier: Clinical Demonstration.
THURSDAY.—2 P.M., Dr. Kinnier Wilson: Out-patient Clinic. 3.30 P.M., Dr. Walshe: Cerebral Tumours.
FRIDAY.—2 P.M., Dr. Adie: Out-patient Clinic. 3.30 P.M., Dr. James Collier: Virus Diseases of the Nervous System.

KING'S COLLEGE HOSPITAL MEDICAL SCHOOL, Denmark-hill, S.E.
THURSDAY, March 2nd.—9 P.M., Dr. J. L. Livingstone: The Treatment of Lobar Pneumonia.

LONDON JEWISH HOSPITAL, Stepney Green, E.
THURSDAY, March 2nd.—4 P.M., Miss M. Landau: Sterility.

NATIONAL COUNCIL FOR MENTAL HYGIENE.
WEDNESDAY, March 1st.—5.30 P.M. (at 11, Chandos-street, Cavendish-square, W.), Dr. J. A. Hadfield: Anxiety.

ST. MARY'S HOSPITALS, Manchester.
FRIDAY, March 3rd.—4.15 P.M. (at the Whitworth-street West Hospital), Dr. Dougal and Dr. Brentnall: Antenatal Demonstrations.

MANCHESTER ROYAL INFIRMARY.
TUESDAY, Feb. 28th.—4.15 P.M., Mr. A. H. Southam: Thyrotoxicosis.
FRIDAY, March 3rd.—4.15 P.M., Dr. A. Ramsbottom: Demonstration of Medical Cases.

GLASGOW POST-GRADUATE LECTURES.
TUESDAY, Feb. 28th.—3.30 P.M. (in the Faculty Hall, St. Vincent-street), Dr. W C. Macartney: Some Diagnostic Points in the Complications of Otitis Media.
WEDNESDAY, March 1st.—4.15 P.M. (at the Lock Hospital), Dr. D. Watson: Venereal Diseases (Female).

Vacancies

For further information refer to the advertisement columns

Aberdeen University.—Lecturer in Medicine. £400.
Bolingbroke Hospital, Wandsworth Common, S.W.—Hon. Surgeon to Ear, Nose and Throat Dept. Also Part-time Pathologist.
Bradford Municipal General Hospital, St. Luke's House.—Phys. and H.S.'s. Each at rate of £150.
Brighton, Royal Sussex County Hospital.—H.S. £150.
Brighton, Sussex Maternity and Women's Hospital.—Res. H.S. £130.
Burnley, Victoria Hospital.—H.P. At rate of £150.
Cambridge, Addenbrooke's Hospital.—Two H.S.'s and Res. Anæsthetist and Emergency Officer. Each at rate of £130. Also H.P. At rate of £150.
Cambridge, Papworth Village Settlement.—3rd Asst. M.O. £300.
Charing Cross Hospital, W.C.—Med. Reg., Surg. Reg. Each £150. Registrar to Nose, Throat and Ear Dept. £100. Also Part-time Medical Registrar. £50.
Chester, East Lancashire Tuberculosis Colony, Barrowmore Hall, Great Barrow.—H.P. At rate of £100.
Connaught Hospital, Walthamstow, E.—Res. H.P. At rate of £100.
Coventry and Warwickshire Hospital.—Res. H.S. £125.
Dover, Royal Victoria Hospital.—Res. M.O. £180.
Farnborough Institution Hospital, Kent.—Asst. M.O. £250.
Guernsey States Mental Institutions.—Mental Officer. £800–£1000.
Hendon Isolation Hospital.—Res. M.O. and Asst. M.O. £500.
Lenham Sanatorium.—Asst. M.O. £400.
Liverpool, David Lewis Northern Hospital.—Cas. O. At rate of £120.
Liverpool Royal Babies Hospital, Woolton.—Res. M.O. At rate of £90.
Liverpool, Walton Hospital.—Res. Asst. M.O. £200.
L.C.C.—Temporary District M.O.'s. £140–£200. Pathologist at Group Laboratory, Mile End Hospital. £1100. Also Asst. Pathologist to Group Laboratories. Each £650.
London Homœopathic Hospital, Great Ormond-street, W.C.—Phys. Also M.O. for X Ray Dept.
Manchester Ear Hospital, Grosvenor-square.—Res. H.S. £120.
Manchester Hospital for Consumption and Diseases of the Throat and Chest.—Asst. M.O. for Crossley Sanatorium. £200.
Manchester Royal Children's Hospital, Gartside-street.—Two Asst. M.O.'s for Out-patients' Dept. Each at rate of £150.
National Temperance Hospital, Hampstead-road, N.W.—Hon. Asst. Physician.
Northampton General Hospital.—H.P. and H.S. Also H.S. to Ear, Nose and Throat Dept. Each at rate of £150.
Nottingham General Hospital.—H.P. At rate of £150.
Oswestry, Shropshire Orthopædic Hospital and Agnes Hunt Surgical Home.—H.S. At rate of £200.
Oxford County and City Mental Hospital, Littlemore.—Asst. M.O. £400.
Plymouth City General Hospital.—Med. Supt. £1000.
Portsmouth, St. Mary's Hospital, &c.—Third Asst. Res. M.O. £250.
Preston, Sharoe Green Hospital.—Res. Asst. M.O. At rate of £150.
Queen's Hospital for Children, Hackney-road, E.—H.P. and Cas. O. Each at rate of £100.
Radium Institute, Ridinghouse-street, W.—Res. Surg. Reg. At rate of £250.
Richmond, Surrey, Royal Hospital.—Jun. H.S. At rate of £100.
Royal College of Physicians, Pall Mall East, S.W.—Membership.
Royal Eye Hospital, St. George's-circus, Southwark, S.E.—H.S. At rate of £150. Also Asst. H.S., Clin. Bacteriologist, and Pathologist. Each £100.
Royal National Orthopædic Hospital, 234, Great Portland-street, W.—H.S. At rate of £150.
St. Albans and Mid-Herts Hospital and Dispensary.—Res. H.S. £150.
St. John's Hospital for Diseases of the Skin, 49, Leicester-square, W.C.—Out-patient and In-patient Med. Regs. Each £50.
St. Mary's Hospital, W.—Director of V.D. Clinic. £400.
St. Peter's Hospital for Stone, &c., Henrietta-street, W.C.—H.S. At rate of £75.
Salford Royal Hospital.—H.P. and H.S. Also Cas. H.S. Each at rate of £125.
Shrewsbury, Royal Salop Infirmary.—Res. Surg. O. £250. Also Cas. O. and Res. Anæsthetist. At rate of £160.
Stafford County Mental Hospital.—Temp. Asst. M.O. £400.
Sutton and Cheam Hospital.—Res. M.O. £150.
Swindon and North Wilts Victoria Hospital.—Res. M.O. At rate of £125.
West Bromwich, Hallam Hospital.—Res. H.P. At rate of £200.
West London Hospital, Hammersmith-road, W.—H.P. Two H.S.'s to Spec. Depts. Also Res. Anæsthetist. Each at rate of £100.
Weston-super-Mare General Hospital.—Res. H.S. £150.
Whipps Cross Hospital, Whipps Cross-road, Leytonstone, E.—Specialist Consultant Gynæcologist. £50, and £5 5s. per visit.

The Chief Inspector of Factories announces vacant appointments for Certifying Factory Surgeons at Droitwich, Worcester; Wells, Norfolk; Almondbank, and Methven, Perth.

NOTES, COMMENTS, AND ABSTRACTS

THE PLACE OF THE ELECTROCARDIOGRAPH IN MEDICINE

By G. F. WALKER, M.D., M.R.C.P.

HONORARY PHYSICIAN TO THE SUNDERLAND ROYAL INFIRMARY AND THE CHILDREN'S HOSPITAL, SUNDERLAND; CONSULTING PHYSICIAN TO THE SUNDERLAND MUNICIPAL HOSPITAL

THE electrocardiograph is an instrument of precision in diagnosis and prognosis. Its utility is very wide but its usage singularly narrow. A fair number of patients are sent for electrocardiographic examination when this is superfluous, but a very large number are deprived of the benefits of diagnostic exactitude because the scope and powers of the instrument are not as yet sufficiently realised. The object of this paper is to survey as fairly as possible, and from the point of view of a general clinician, the place of the electrocardiograph in medical science.

A few disabilities and limitations of the instrument must first be admitted. It is costly and complex, and a peculiar knack is required for its handling. Records taken by it represent a very short sample of the heart's action, and if they show a lesion they give no clue to its pathological nature nor to whether it is active or quiescent. In certain cases small and clinically unimportant lesions cause conspicuous changes in the records and, conversely, a normal record is in certain circumstances possible from a diseased heart. There is a very wide range of normal in electrocardiographic records, and this applies especially to children. Moreover, many records tend to be vitiated or reduced in value by somatic tremors or visceral movements. Finally, in a few heart cases the electrocardiograph is totally superfluous, and a step-ladder will give better evidence of the presence of cardiac reserve or otherwise. Hence, as in all technical aids to clinical medicine, electrocardiographic reports must be considered alongside other data, as contributory to general diagnostic investigation.

But there are very many heart illnesses, some frank and some highly obscure, in which electrocardiographic examination yields valuable information. In a certain number of diseases and disorders the data secured by electrocardiographic examination cannot be secured in any other way whatever. It is notable that in those very cases the question of complete diagnostic precision is often of supreme importance to the patient in connexion with employment, life insurance, or travel.

The clinical utilities of the instrument may be considered under several heading, as follows:—

(*a*) In the investigation of the nature of cardiac arrhythmia.
(*b*) In the assessment of myocardial power and integrity, with special reference to medical or surgical treatment.
(*c*) In the determination of lack of ventricular balance.
(*d*) As a control in therapy.
(*e*) For further investigation of illness of known cardiac nature.
(*f*) For further investigation of painful or constitutional illness of obscure origin.
(*g*) In determination of prognosis of many diseases.
(*h*) As a guide to convalescence in many acute fevers.
(*i*) As an instrument of research.

Before considering these it is necessary to recall that the basis of the value of the electrocardiograph is its power to delineate separately auricular contraction, ventricular excitation, ventricular contraction, and ventricular relaxation. The records are obtained from three different angles of observation, and a timing mechanism enables time relationships of muscle activity to be determined with the greatest accuracy down to one-fifth of a second.

How the Electrocardiograph Helps the Clinician

In what follows there is no attempt to deal with the interpretation of the records nor the mechanism of production of the different types of curves. This review is purely in answer to the question from a general clinician: How can this instrument help me?

INVESTIGATION OF CARDIAC ARRHYTHMIA

When the pulse is irregular the exact diagnosis is often highly uncertain. The following are the common causes, and they will be recognised at once as widely different, alike in ætiology, treatment, and prognosis: sinus arrhythmia; extrasystoles, including paroxysmal tachycardia; partial or complete heart-block at any point; auricular fibrillation; and auricular flutter.

The differential diagnosis in all these, and in their combinations and complications, is infallibly disclosed by electrocardiographic examination.

ASSESSMENT OF MYOCARDIAL POWER AND INTEGRITY

Apart from ordinary clinical examination it is often necessary to secure definite information as to the myocardium in conditions such as diabetes, exophthalmic goitre, and prostatic hypertrophy. Subject to the limitations mentioned, the instrument is often of value in delineating conditions such as: diminution in auricular force, recent coronary occlusion, cardiac infarction, impaired myocardial nutrition, or diminished conductility.

Conversely, repeated normal electrocardiographic records add considerably to the data required for prognosis in conditions such as cholelithiasis; or in other cases they may fortify a clinician's opinion that symptoms ostensibly and even aggressively cardiac may in fact be of other origin or exaggerated.

DETERMINATION OF LACK OF VENTRICULAR BALANCE

The question of inordinate unilateral ventricular hypertrophy arises in conditions such as lead poisoning, hypertension, and long-continued physical stress. The extent of this hypertrophy can be ascertained with precision by instrumental methods only. Sometimes such instrumental ascertainment is strikingly at variance with the impressions gained from ordinary clinical examinations.

Other conditions in which an accurate estimation of unilateral ventricular hypertrophy is of high value are exophthalmic goitre, adherent pericardium, aortic disease, chronic bronchitis with emphysema, bronchiectasis, and pulmonary stenosis.

CONTROL IN THERAPY

The chief utilities of the instrument in this respect centre round accurate diagnosis and the clinical employment of digitalis, quinidine, adrenaline, and drugs acting on the blood pressure. It is highly desirable to know the point at which the optimum effect of digitalis is being exerted. Beyond a certain point the drug exerts a toxic and blocking effect on the conductile and contractile tissues of the heart. By delicate and pathognomonic changes in the T-wave, unlike changes seen in any other known condition, it is possible to predict digitalis saturation and impending intolerance a considerable time before the better-known general constitutional signs of digitalis poisoning appear. Indeed, when these do appear, irreparable damage has probably already been done to the conducting tissues of the heart, and therefore every patient requiring to take digitalis for long periods should be periodically examined by electrocardiograph with particular scrutiny of the T-wave. Digitalis is probably over-prescribed, and for two reasons. Firstly, there may be erroneous diagnosis, as for example when extrasystoles mimic auricular fibrillation; secondly, the signs and symptoms of ordinary heart failure may pass insiduously into those of toxic heart failure from digitalis.

The utilities of quinidine depend on a completely accurate diagnosis of fibrillation or flutter, or a

particular type of paroxysmal tachycardia. The drug is necessary and efficacious—no other remedies have any action—in paroxysmal tachycardia of ventricular origin. In the other types of paroxysmal tachycardia quinidine is of doubtful value and often useless, but vagal compression is successful in a certain proportion of cases. The determination of the site of origin of paroxysmal tachycardia without electrocardiographic survey is pure guess-work.

There is room for considerable further instrumental research on the action of adrenaline on the myocardium and conducting tissues. The drug has a specific and peculiar action in effecting regularity and acceleration of the heart in nodal rhythm, but the deductions to be drawn from this clinical curiosity and applied to conditions like Stokes-Adams disease are not yet clear.

FURTHER INVESTIGATION OF DISTURBANCE OF KNOWN CARDIAC NATURE

Such illnesses include tachycardia, precordial pain, cardiac irregularity with suspected block, suspected toxic cardiac myopathy, and fibroid or senile cardiac degeneration.

Tachycardia may be of a nature easily and usually determined by ordinary clinical examination, but the diagnostic value of an electrocardiograph in determining the site of origin of true paroxysmal tachycardia is of unique importance.

Precordial pain of known cardiac origin may be anginal or due to coronary thrombosis. The treatment and prognosis of these two conditions are very widely different; for example, the administration of amyl nitrite to a patient suffering from coronary thrombosis may be definitely harmful or even fatal. The drug may lower pressure and permit further thrombosis. Distinction between angina pectoris and coronary thrombosis is often possible without electrocardiographic review, and obviously such review is frequently impracticable or inconvenient. When practicable, however, differentiation is clear. There are curves pathognomonic of angina pectoris, and these differ substantially from those of coronary thrombosis. Moreover, the cardiac scars and infarctions of coronary thrombosis can be detected with certainty long after the subsidence of the acute process, and such detection aids in diagnosis and treatment.

Cardiac irregularity with suspected block should always recall the aid of instrumental scrutiny. Ordinary clinical examination in these conditions is sometimes very uninformative.

Toxic cardiac myopathy may be brought about by digitalis, as already mentioned, but there are many other causes. Not very much evidence of value about the myocardium can be instrumentally obtained in cases of ordinary toxic goitre, but decidedly important data are sometimes secured in conditions like pyorrhœa. In the latter case repeated cardiac infarctions have been demonstrated, followed by amelioration under dental treatment.

Not much evidence of value is obtained by the examination of merely senile and fibroid hearts, except that occasionally bundle branch block is unexpectedly revealed in such cases and materially alters the prognosis. The electrocardiographic signs of bundle branch block are decisive, and there is no other means of detecting the lesion. It is especially important in the matter of prognosis that serial records be taken of this condition.

FURTHER INVESTIGATION OF PAINFUL OR CONSTITUTIONAL ILLNESS OF OBSCURE ORIGIN

Myocardial disease often mimics disease elsewhere. The conspicuous difficulty in angina pectoris when the pain is referred to the abdomen or the trunk is well known. Paroxysmal auricular fibrillation may offer great difficulties by its power of simulating abdominal catastrophe. Sundry forms of heart-block mimic apoplexy; epilepsy and Stokes-Adams disease will be recalled in this connexion. In all these difficulties electrocardiographic study will often—not always—yield data of diagnostic value. In particular, the electrocardiographic changes during and immediately following an attack of true angina pectoris are pathognomonic and unlike those seen in any other condition. They serve to differentiate angina pectoris not only from coronary thrombosis but from other conditions of intense pain. Thanks to some exemplary research it is now known that pain, such as gall-stone colic, does not disturb the electrocardiograph. In passing, a possible fallacy must be mentioned: liability to angina pectoris may coexist in a patient with the presence of pain-producing lesions such as gall-stones.

AS A GUIDE IN PROGNOSIS

Prognosis depends on diagnosis, and in so far as an electrocardiogram assists in, or reveals, diagnosis it may indirectly be of surpassing value in prognosis. With one exception, however, electrocardiographic records are not of conspicuous direct value in prognosis unless serial records are taken to determine the evolution or regression of a lesion such as myocardial gumma or infarct. The exception is auricular fibrillation, and in this common and important condition it has been found that the amplitude of the fibrillation waves is in general larger in the rheumatic cases and that a prolonged or aberrant Q R S notably diminishes the expectation of life.

CONVALESCENCE

Related to prognosis is convalescence, and here it may be stated dogmatically that in the determination of cardiac myopathy following acute fevers the electrocardiogram should be resorted to much more freely. This particularly applies to post-influenzal debility, but the most thorough survey has hitherto been made in diphtheria. The most serious cardiac disabilities, totally unsuspected under clinical examination, may be revealed by electrocardiographic scrutiny, and these include conducting lesions and focal myocardial lesions. Conversely, an electrocardiogram may sometimes reverse an unnecessarily gloomy prognosis based solely upon auscultation. As for diphtheria, so for scarlet fever and typhoid.

Obviously no case convalescent from rheumatic fever or chorea is fully assessed without electrocardiographic examination. One has a feeling, based on an insignificant few cases hitherto, that the tendency is to prolong convalescence in these diseases unnecessarily.

Conclusions

If ever an instrument was expressly capable of yielding massed statistical research and report of international scope, that instrument is the electrocardiograph. A beginning has already been made on such widely different topics as chloroform anæsthesia, tobacco poisoning, and athleticism, but one cannot but deplore the absence as yet of really large-scale collaboration in amassing data and comparing results. The great amount of work already done should stimulate wider and wider usage of the instrument and more pooling of reports. Such reports will emanate from individual workers, but their cumulative value in matters of diagnosis and prognosis could, if properly collected and examined in conjunction with long-term clinical data, add heavy and valuable volumes to the science of medicine.

FOLIA OPHTHALMOLOGICA ORIENTALIA

UNDER this title a new ophthalmological quarterly is intended to serve the southern section of the Mediterranean countries together with Mesopotamia and Persia. It is published in Jerusalem under the editorship of Dr. Aryeh Feigenbaum, and the articles are in one of three languages, French, English, and German, each article being accompanied by short summaries in all three languages. There are over 30 distinguished collaborators, mostly European, but some from the Eastern countries; the aim of the production being twofold, on the one hand to foster close collaboration between the ophthalmological specialists of the Middle East, and on the other to

bring to the notice of their colleagues in the West the special peculiarities of ophthalmic practice in that part of the world. The first number, published in November last, contains much interesting matter, and includes articles by Max Meyerhof, of Cairo, on fifty years of ophthalmological progress in Egypt, and by R. H. Elliot (London) on the special features of ophthalmological practice in Eastern countries. I. Taborisky (Haifa), Rowland P. Wilson (Giza), R. Peters (Basra), and A. Sinai (Tel-Aviv) write on different aspects of trachoma; A. Trantas (Athens) on the location of foreign bodies in the ciliary and post-ciliary regions; Moh Sobhy Bey and E. J. Attie (Cairo) discuss Barraquer's method of cataract extraction; N. Shimkin (Caiffa) the bitemporal hemianopsia of pregnancy; and Aryeh Feigenbaum (Jerusalem) the origin of lenticonus anterior. If succeeding numbers keep up the standard of the first issue they will be more than worth the modest subscription.

DR. MARY WALKER

Mrs. C. W. M. Poynter, 1306, South Thirty-fifth-avenue, Omaha, Nebraska, U.S.A., is working on a biography of the late Dr. Mary E. Walker, of Oswego, New York, and would be glad of any information about her visit to this country in 1866–67, when she went the round of the London hospitals and gave many lectures in England and Scotland. It appears from our own columns of the time that Dr. Walker had practised medicine in New York for five years before the war between North and South broke out, when she volunteered for the Federal Army Medical Service, and served through a campaign of four years, being taken prisoner and exchanged after a few months for a male surgeon. Her visit was largely occupied with controversy on the dress appropriate for women. Dr. Walker herself was of opinion that, from a physiological point of view, the great weight of clothes then carried from the waist was open to objection, and her own garments were suspended from the shoulders, which she described as "a physiological dress with moral bearings." THE LANCET, although hesitant about the advisability of Dr. Walker's example being generally followed by her sex, commended her to the courtesy of hospital authorities and the medical profession; but a lecture which she gave at St. James's Hall on Nov. 20th, 1866, on the experiences of a female physician was, we are told, "marred by the singing of Rule Britannia and the more familiar but less refined Slap Bang," until police assistance was secured. There was, we gather, no impediment put in the way of Dr. Walker's visits to hospitals, for it is stated that she attended operative practice at the Middlesex Hospital, where she witnessed removal of dead bone from a jaw and the attempted reduction of an old dislocation of the humerus.

BROADCASTING THE LOSS OF DRUGS

THE British Broadcasting Corporation informs us that, while the S O S service is normally restricted to matters of life and death, the service has hitherto been extended to messages referring to the loss or theft from doctors' cars of bags containing dangerous drugs, with appeals to the public for help in tracing them. Five messages of this kind were broadcast from the North Regional transmitter, and two from other transmitters during 1932. The Corporation point out that, while assistance of this kind has been given in the past, the loss of a bag containing dangerous drugs hardly fulfils the condition of extreme urgency which justifies this service, since, in their view, it is unlikely that anyone who had stolen or found a doctor's bag would deliberately sample its contents and run the risk of being poisoned. This intimation must, it seems, be taken as a warning that such messages will in future be accepted for transmission with some reluctance, and may eventually perhaps be refused.

IODINE COMPOUNDS IN THYROID DISEASE.—In the report of a discussion at the Royal Society of Medicine, published in our last issue (p. 365), Prof. C. R. Harington is credited with saying that "the most suitable mode of administration of iodine was in the form of diuretyrosine." This last word should, throughout the report, be *diiodotyrosine*.

THE author of "Things to be Desired, or Daily Health Reminders," reviewed last week in this column, was Dr. W. W. Shrubshall. We regret the omission of the second letter "h" from his name as printed.

Appointments

GALLOWAY, T. M'LAREN, F.R.C.S. Edin., has been appointed Asst. Physician, Cumberland Infirmary.

JONES, NANCY LLEWELYN, L.R.C.P., M.R.C.S., Resident Anæsthetist, Queen Charlotte's Maternity Hospital.

LAWSON, D. F., B.Chir. Camb., L.R.C.P. Lond., M.R.C.S., Hon. Asst. Radiologist, Leicester Royal Infirmary.

SMITH, F. W. G., M.D. Dub., D.P.H., D.O.M.S., Refraction Assistant, East Ham Memorial Hospital.

WEST, H. O., M.D., B.S. Lond., Medical Superintendent, St. Giles's Hospital, Camberwell.

St. Thomas's Hospital, London: GOADBY, H. K., M.D. Camb., M.R.C.P. Lond., Deputy Director of the Medical Unit; CHAMINGS, A. J. W., M.B. Camb., F.R.C.S. Eng., Chief Assistant in the Ear, Nose, and Throat Department; MARSHALL, E. H., M.R.C.S., Chief Assistant in the Physiotherapy Department.

Certifying Surgeons under the Factory and Workshop Acts: ADAM, D. C., M.B., Ch.B., D.P.H. Edin. (Ilfracombe); BLAKELY, A. D., M.D. Glasg. (Longton, Stafford); JOHN, A. H., M.B., B.S. Lond. (Stoke, Stafford), and PALMER-W. H., M.B., B.S. Lond. (Hayle, Cornwall).

Births, Marriages, and Deaths

BIRTHS

BENEY.—On Feb. 18th, at 3, Wilbraham-place, S.W.1, to Dorothea (née Pridden), wife of Charles Beney, 130, Harley-street, and Keston, Kent—a son.

MORTON.—On Feb. 19th, at a nursing home, the wife of Dr. Robert Morton, Ashbourne-avenue, Golders Green, London, of a daughter.

SELOUS.—On Feb. 17th, at a nursing home, the wife of Cuthbert F. Selous, M.B., of South Lawn, Clarence-road, Tunbridge Wells, of a daughter.

WALLACE.—On Feb. 1st, at Murrayfield, Horsham, Sussex, the wife of J. H. Wallace, L.D.S., of a daughter.

MARRIAGES

DOWLING—HEARN.—On Feb. 14th, at Brompton Oratory, Lieut.-Colonel F. T. Dowling, R.A.M.C. (retd.), to Jessie Florence, widow of Alfred Booth Hearn, of The Gleanings, Folkestone.

EVERETT—PERRY-GORE.—On Feb. 18th, at St. John's Church, Regent's Park, N.W., Leslie S. Everett, M.R.C.S., L.R.C.P., Penzance, to Joan M. Lucy Perry-Gore, Oxford.

DEATHS

BEATSON.—On Feb. 16th, at Woodside-crescent, Glasgow, Sir George Thomas Beatson, K.C.B., K.B.E., M.D., D.L., in his 85th year.

BENHAM.—On Feb. 14th, 1933, of pneumonia, Harold Walter Benham, M.B., M.R.C.P. Lond., second son of the late Dr. C. H. Benham and Mrs. A. Benham, 88, The Ridgeway, N.W.11, aged 24 years.

CORBOULD.—On Feb. 15th, at Coleherne-court, S.W., Victor Albert Louis Edward Corbould, M.D., M.R.C.S., L.R.C.P.

CURRIE.—On Feb. 19th, at Oxford-terrace, W., after a very short illness, Andrew Stark Currie, M.D.

ELLIOTT.—On Feb. 14th, at Osborne-road, Clifton, Bristol, Christopher Elliott, M.D., in his 84th year.

HYSLOP.—On Feb. 12th, at a nursing home in London, after a long illness, Theophilus Bulkeley Hyslop, M.D., C.M., M.R.C.P. Edin., F.R.S.E., late of Portland-place, W., and formerly medical superintendent of Royal Bethlem Hospital.

SMITH.—On Feb. 16th, suddenly, of heart failure, at Kilburn Park-road, N.W., Robert Montgomery Travers Smith, M.D., in his 76th year.

THATCHER.—On Feb. 13th, at Milnthorpe, Gullane, East Lothian, Charles Henry Thatcher, F.R.C.S. Edin., aged 78.

WHITE-HOPKINS.—On Feb. 12th, at Regina Hotel, Nice, Major J. White-Hopkins, late R.A.M.C., aged 81.

N.B.—A fee of 7s. 6d. is charged for the insertion of Notices of Births, Marriages, and Deaths.